What's in This Issue

In the $200,000 contest conducted by the James F. Lincoln Arc Welding Foundation, one paper stood out above all the others and the authors, A. E. and M. W. Gibson, received the grand award of $13,941. It was such an excellent treatise on **what the commercial weldery can and does do** that we have briefed it beginning on page 1002.

A. E. Gibson

The spotlight is on the automobile industry. **Newest plant in that industry** is Ternstedt's Trenton, N. J., factory for manufacture of body hardware. There you will find the latest in roll-forming machines, nickel-plating equipment, spot welding and various metal-finishing processes. Look on page 997 for the picture story of this plant.

What problems will come up if the United States should begin mass production of airplanes? **How many planes can we make** now in a single year? What is our air strength compared with other countries? The answers to these questions are on page 1020a.

Maintenance men as well as production shop men will get **some handy ideas** by turning to page 1018. "Ideas From Practical Men," a regular *American Machinist* feature, is packed with good stuff.

It is hard to beat **a system of inspection** which simulates conditions met in service, unless it be actual service itself. Anyway, the system used in checking accuracy of operations in finishing parts for the Moore jig borer is a dandy. On page 1006 is shown the way it is done.

What are companies doing to give employees **more information about their affairs** and what are they doing to establish a better understanding between themselves and the public? Ten cases are outlined briefly on page 1008 in an article, "Glad to Know You," which should provide you with some useful ideas.

What process to use for lacquering, enameling or japanning metal products is a tough problem to decide. The decision can best be made when applications and limitations of the various processes are known and considered. Dr. Gustave Klinkenstein brings you a practical discussion of the factors involved in his article "Selecting the Finishing Process" on page 1010.

Dr. Gustave Klinkenstein

Proper pressures for **right-angle bends in steel** are outlined on page 1017 as part of *American Machinist's* Reference Book Sheet service.

Do you know **what's new in shop equipment**? The best place to read about new stuff is on page 1021. Don't overlook this bet.

The die designer, to be most effective, should have **a working knowledge of die nomenclature**, layout methods, quality grades of dies and the cost of producing dies. C. W. Hinman, in his eighth installment on "Press Working of Metals," treats this subject thoroughly on page 1013.

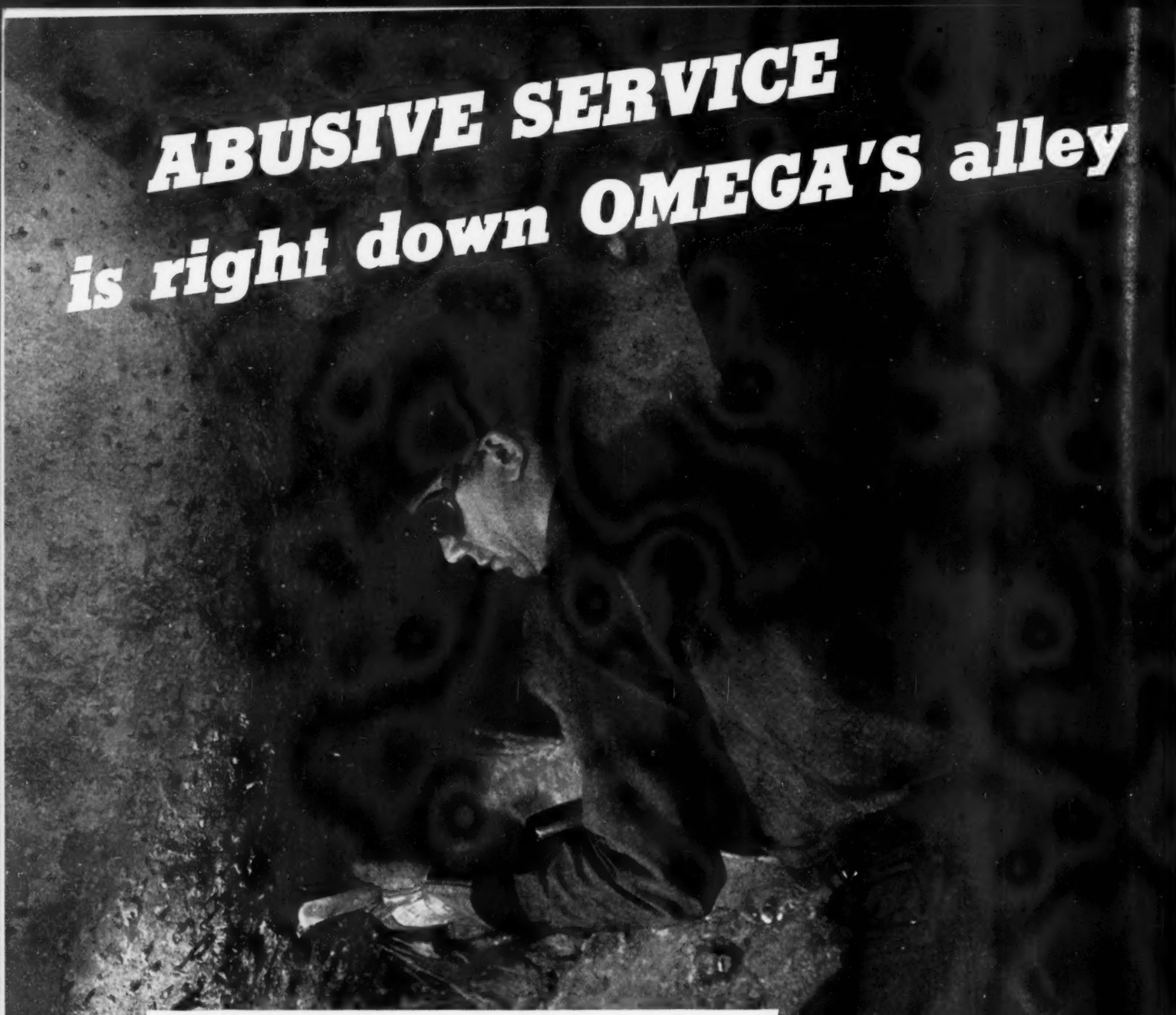
COMING

Fred H. Colvin, our editor emeritus, who last year celebrated his 30th anniversary on the *American Machinist* staff, is back from a jaunt through Mexico. The first article on his impressions of industrial conditions south of the Rio Grande will appear shortly.

A certain restaurant advertises itself "From a sandwich to a national institution." Arc welding could well paraphrase the slogan to "From a patch to a national industry." Only a few years ago the electric torch was the shop's "putting on" tool—a handy way to salvage parts which would otherwise be scrapped because of errors in machining. Today Lukenweld, Inc., devotes itself entirely to welded fabrication and turns out weldings just as a foundry turns out castings. You can read about its operations in a forthcoming article.

Rumors travel fast in small and medium-sized towns—especially industrial towns where men meet at work and wives talk over the back fence when their husbands are in the shop. Stories about making a living rank high—this shop is going to lay off, that shop will start up next month, Bill Smith got a raise. Stories when straight reflect healthy curiosity in the welfare of the community; when false they may create unmeasured mischief in spreading needless alarm. Shop managers in Peoria, Illinois, resolved to tell the community what was going on so the back fence stories would reflect fact, not fallacies. How it was done is told in another of our Public Relations series.

ABUSIVE SERVICE is right down OMEGA'S alley



THE battering that pneumatic-hammer tools have to take is just what Omega Tool Steel is made for. It has an exceptional combination of hardness and high ductility that defies repeated shocks. It's a natural for hand and pneumatic chipping chisels, heading tools, punches and similar tools.

Omega is only one of the complete range of Bethlehem Tool Steels. Perhaps your special requirement is for a die steel with minimum shrinkage, or a high-speed steel that will stand up to heavy hogging cuts in tough materials. Bethlehem makes these and other steels, each as much a leader in its field as Omega. Reference to the Bethlehem Tool Steel Guide will aid you in the selection of the grade to handle your tasks.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

AMERICAN MACHINIST

ESTABLISHED 1877

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BURNHAM FINNEY, Editor

What—Beans Again?

YES, it looks like you're going to get beans again, though we'll try not to make them a steady diet. Beans on the editorial menu happen to be the foreman and what he can do for you.

You say, "I've heard so much about the foreman that I'm sick of him." Maybe so, but like death and taxes, he's always with you. If you operate a business which is big enough to occupy more space than an ordinary garage, you have at least one of him or two. And when you begin to employ many people, the number of foremen on your payroll goes up in a hurry.

"All right," you comment, "but why all the fuss just now about the foreman? Let the man alone for awhile. Don't keep at him all the time or he, or we, will get the jitters."

Well, we wish that we could lay off him for a time, but we have a few thoughts about him that we must get out of our system. So here goes.

The chief contact that any employee has with your company is with the foreman who is his boss. He soon forms an opinion whether his boss is a great guy or a heel, and his opinion usually is right. If he gets the idea this his foreman is all right, he is likely to think that he is working for a pretty good company. But if he is down on his foreman, what he thinks of the company probably is unprintable.

Now just where does that leave you, Mr. Manager? You have rightly been getting worried lately about this matter called "public relations." President George D. Brook of the Chesapeake & Ohio Railway says that "good public relations is the courting of friendly public opinion." What chance have you of courting friendly public opinion in your community if your own employees don't like to work for you? And whether they like to work for you—and tell their neighbors so—depends pretty much on what their foremen's relations to them are.

We weren't a bit surprised when a friend told us about the action of an important metal-working company in setting up classes in personal psychology for their foremen. The management wanted the supervisors to learn the art of getting along with people so that they could better get along with their own men.

WHETHER you go in for personal psychology or not, you shouldn't sit back complacently and say to yourself that everything is going along all right with your foremen. Recent labor legislation has made their jobs harder. They have to be real diplomats in handling men and most of them haven't had any training in being "career men." Whatever time and money you can spend in helping them to understand their jobs better will not be wasted.

So if you are interested in giving more than lip service to the movement for improved relations between industry and its employees and between industry and the public, you should begin at home, if you haven't already, on your foremen.

Gaging Business

IT'S too early to appraise the full effect of election results on industry, but already some centers see indications of improvement. Sensitive to political implications for the past six years, business now feels that it has a congress able to resist measures definitely detrimental to its forward movement. Another bullish factor is the favorable reception to new models shown at the current automobile shows.

The machine tool builders' index for October at 118.8 was fractionally better than the September mark. Steel operations are up sharply with the current rate at 62.6 per cent. Electric manufacturing improved, too, with N.E.M.A. reporting a level of 99.3 in motor production. *Business Week's* Index at 101.0 topped the corresponding last year's mark by half a point for the first time since business began pointing downward in the summer of 1937.

BOSTON—Machine tool builders are active on foreign orders, and domestic sales prospects are improving rapidly. Government business for arsenals and navy yards is increasing. Textile mills are operating at a higher rate due in part, at least, to increased automotive demand. Electric furnace sales to European buyers have gained.

NEW YORK—October was by far the best month New York has seen this year. A slight pre-election hesitation has given way to a resumed upward trend. Government inquiries foreshadow a good volume of machine demand by the army and navy.

PHILADELPHIA—Small gains in machine tool buying give indication of an improvement over the recent low state of inquiries and orders. Some sources anticipate a genuine buying wave during the next three months.

PITTSBURGH—The better demand for steel has bolstered Pittsburgh's spirits. While railroad buying still lags, Detroit's needs have risen more rapidly than expected. Machine tool outlook is better than during the comparatively poor month of October. Waning C.I.O. influence gives promise of industrial stability.

CINCINNATI—The machine tool center still awaits the betterment of domestic orders that follow a general upswing in business. Right now manufacturers are riding on an even keel, but foreign orders are still out of proportion to total volume.

CLEVELAND—Plenty of inquiries give promise of business ahead but so far closings are slow. Even at the present rate, machine tool concerns should hold their own for the balance of the year with the ever-present possibility that a better order-to-inquiry ratio will give a real boost in volume.

CHICAGO—District steel operations and electric power consumption continue to rise, but improvement is not general. Makers of cut gears and gear reducer units have not yet experienced an upturn. Manufacturers of plumbing ware are reported running at less than half of capacity. Foundries are still in the doldrums. Expansion of employment at Milwaukee is a favorable factor, renewed activities in automotive and farm implement lines and in steel fabrication being responsible. International Harvester is expected to put on 200 more employees at its Milwaukee works this month. Current employment there is about 2000, compared with a normal of 4000 and a peak of 65,000.

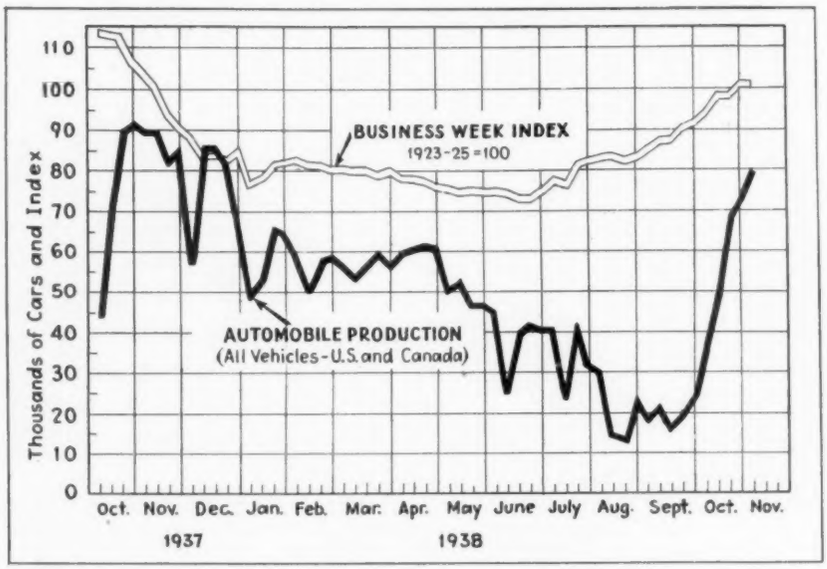
DETROIT—Though perishable tool orders are being held down to minimum requirements, suppliers say that business is on the upgrade. Customers' stocks are low and more tools soon will be needed by car manufacturers whose production is increasing. One supply company has put its factory on a six-day week in response to what it terms "a buying wave." This, however, is not general.

ST. LOUIS—Generally speaking there is an expansion in automotive lines. Wagner Electric has extended its facilities to take care of a portion of Ford hydraulic brake demand.

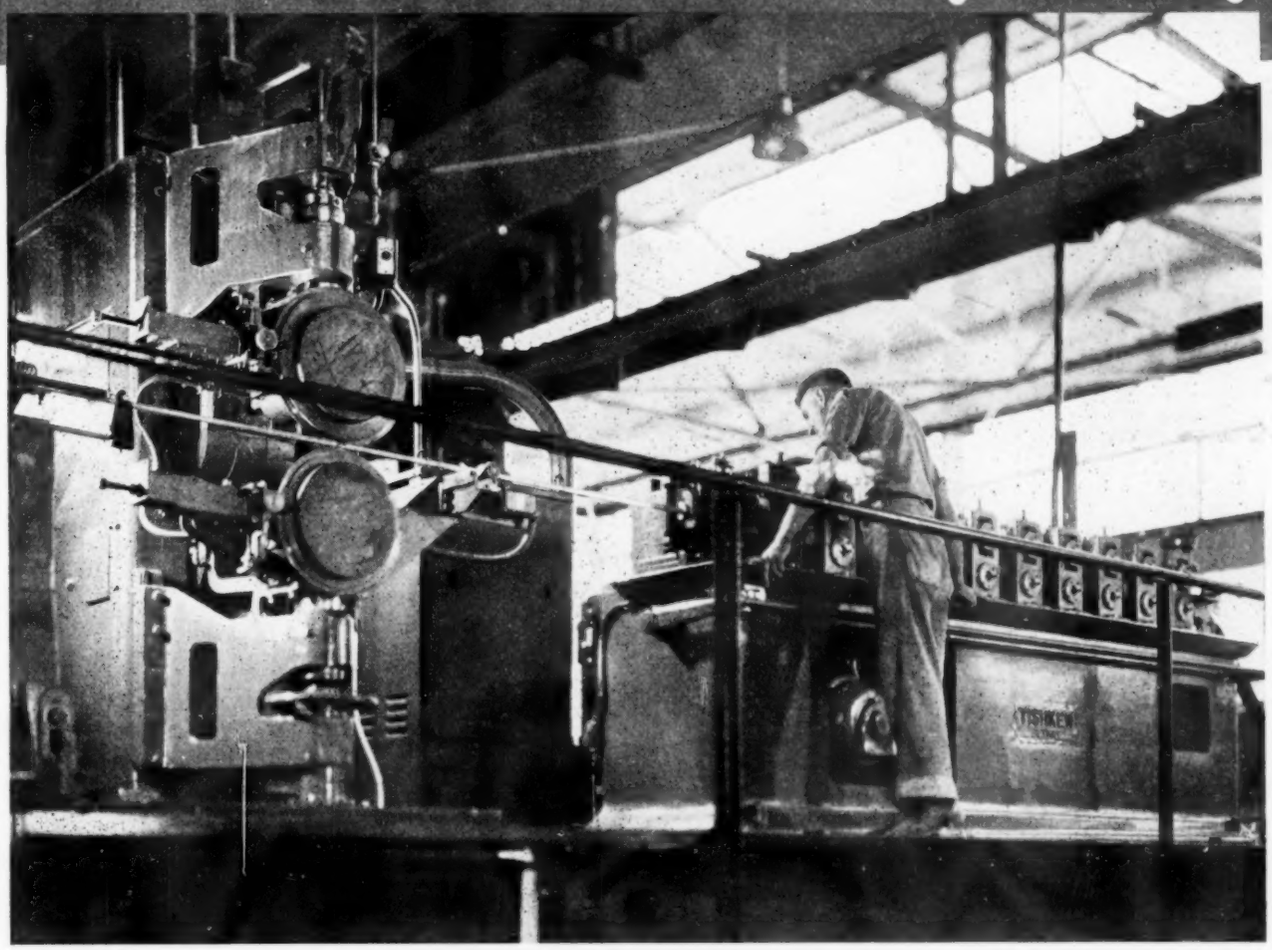
SAN FRANCISCO—Definite improvement in Pacific Coast business has been evident for weeks. Conservative voting which killed crackpot schemes is considered a favorable indication. The narrow defeat of the anti-picketing measure showed a strong sentiment against labor unrest.

AUTOMOBILE PRODUCTION VS. GENERAL BUSINESS

A skyrocketing automobile production curve is a natural thing at this time of year, but the significant fact is that authorities expect it to top last year's performance by more than 25 per cent



Hardware the Easy Way

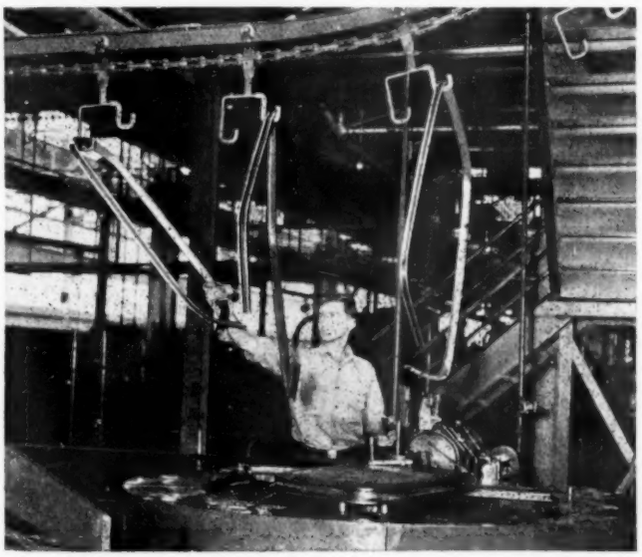


A variety of sections employed in Fisher turret top bodies is roll formed in a battery of special machines such as that shown at the right. This particular set-up rolls and welds (at the left) the U-shaped steel bows that reinforce the one-piece steel roof

MANUAL operations, usually responsible for employee fatigue, have been virtually eliminated in the new plant of the Trenton Ternstedt Division of the General Motors Corporation. Operated under the general direction of the Fisher Body Division, this latest unit is devoted to the manufacture of automobile body hardware and fittings for shipment to assembly plants in the East and South.

The 20-acre factory was officially opened on November 15.

Through the use of monorail conveyors, conveyor belts, elevators, and chute-fed bins practically every handling operation has been mechanized. More than that, the materials handling equipment is designed to deliver the work at correct table level so that bending or reaching becomes unnecessary. Another provision in the interest of the worker is the establishment of banks of materials at strategic points throughout the plant to prevent lay-off of operators further along the produc-



Leaving the roll forming machines as continuous channel sections, steel garnish moldings are cut to exact lengths before being bent to shape on machines of the type illustrated

After cleaning and the application of a ground coat, garnish moldings are wood-grained by the use of gelatin rolls. The work is carried out in an air-conditioned shop to eliminate defects

A metal shield between electrodes and operator affords protection against flying sparks in this spot welding operation. A narrow slot below the glass observation window permits insertion of the work

Every face, corner and crevice of door handles is polished on this rotary machine which imparts the proper color to the nickel plate before chromium plating. Work is carried in special fixtures

tion cycle in the event of equipment failure.

When regular production is reached it is planned to maintain a bank of 5,000 garnish moldings between manufacturing and finishing departments, enough to keep the latter running for a full eight-hour shift. A month's supply of all materials will be kept on hand at all times in a 75 x 920 ft. storage craneway. Storage hoppers between many individual machines make it possible for the operator to leave his post for as long as ten or fifteen minutes without the necessity of seeking someone to relieve him. About 85 per cent of the total wall area of the plant is of glass, giving the benefit of natural illumination by day. Modern lighting units provide ample illumination during the night.

The main manufacturing area consists of 23 bays, 40 ft. in width and 425 ft. in length. Of these eleven are 29 ft. in height with the remainder 17 ft. At the western end at right angles to the manufacturing bays, is the receiving and raw material storage craneway, with a train shed capable of accommodating eighteen cars at a time. At the other end of the plant, a similar section 200 x 920 ft. is divided into an upper and lower floor, the latter serving as a warehouse and shipping room with an inclosed train shed and truck loading dock.

It is possible to store a full 18½ days production in the warehouse, or some 46,250 complete sets of body hardware packed ready for shipment.

Manufacturing layout is such that similar parts may be fabricated on the same lines by changing dies or omitting certain operations. To provide hardware for a single automobile

body approximately 787 different items must be made and assembled, so it would be uneconomical to provide an individual line for each part.

Finishing, polishing and packing of such parts as the window and windshield garnish moldings and glove compartment doors is done on the second floor above the warehouse and shipping room. This department occupies two areas, one 50 and the other 70 x 640 ft., with a light well 25 ft. wide between. Side walls of these units are constructed of glass brick, and air taken into the department is filtered. Two rooms approximately 40 ft. square, where the graining is done, are air conditioned.

The plant layout, worked out in detail by a corps of experts before the architectural department was called in, is designed to save the time required to transform all materials into completed body hardware. Turnover will be as rapid as present-day knowledge of fabricating technique permits.

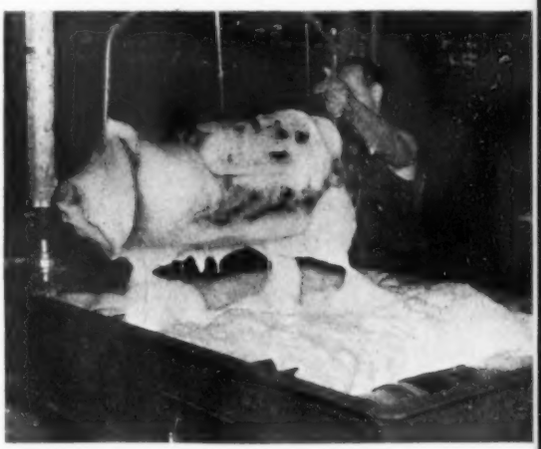
Five major manufacturing departments occupy the main floor: (1) mechanical hardware, (2) garnish moldings, (3) painting, (4) control ventilators, and (5) die castings.

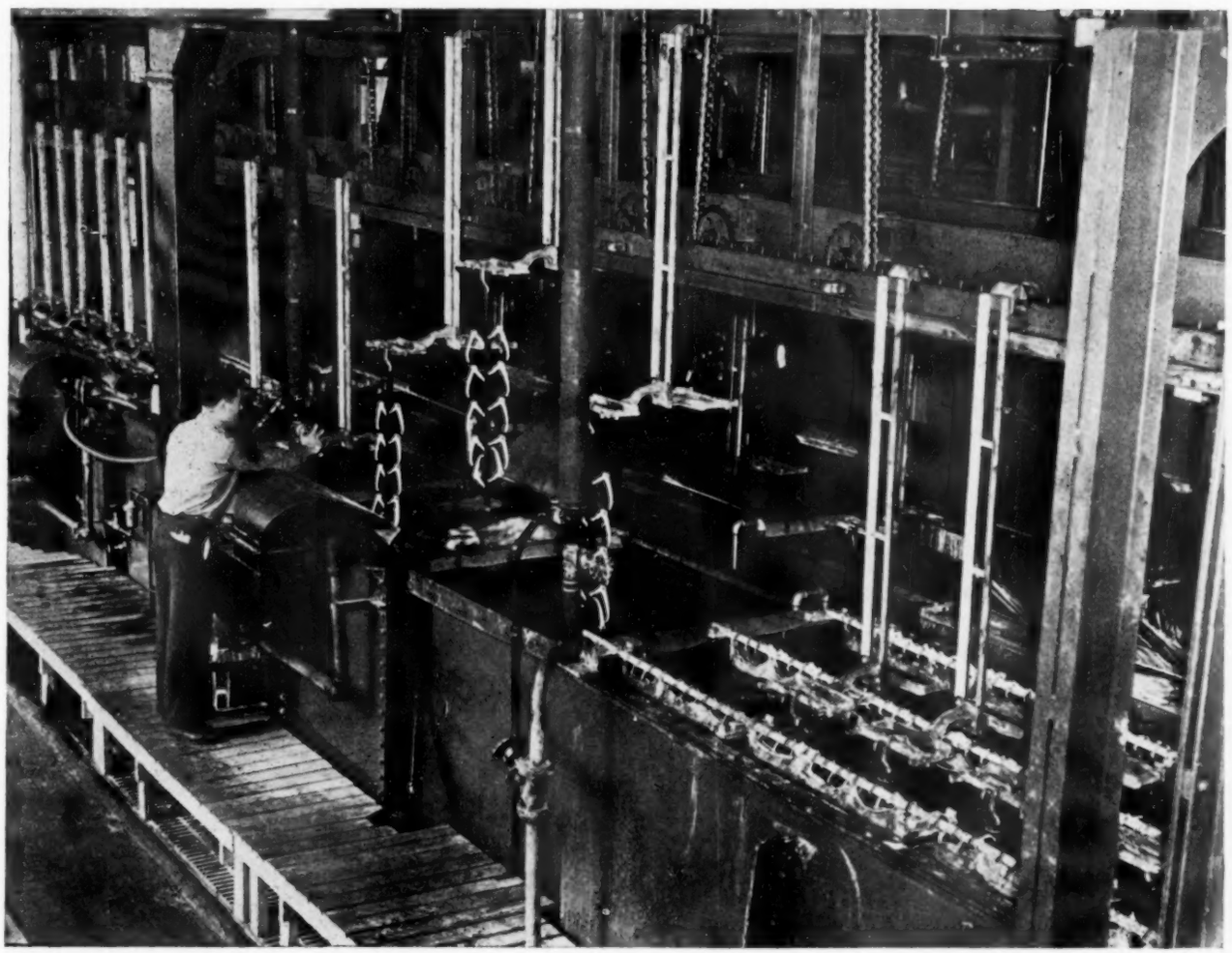
The mechanical hardware department comprises three separate sections. The first of these houses facilities for producing such items as seat adjustment mechanisms, cowl ventilators, drip shields, for the no-draft ventilation system, door bumper caps, door check links, compartment door hinges, trim and wind hose retainers and window regulators. All unexposed parts made in this department which are finished with a coating of black enamel are run through a huge overhead enameling installation, 100 ft. long served by a monorail conveyor 1,031 ft. in length. Such parts as bumper caps, door check link assemblies, cowl ventilator cover assemblies, and door lock strikers, on the other hand, go through a bonderizing treatment, combined with a ground coating, the final finish being given them at the Fisher Body and General Motors assembly plants to which they are shipped.

The second section in the mechanical hardware department occupies two bays and is concerned with the production of deck compartments, door and remote control locks. Zinc-coated strip stock is used in the manufacture

Extremely small parts, instead of being polished by machine or hand, are burnished in metal barrels with thousands of ¼-in. steel balls. Agitation in a solution of cleaner and soap prepares the parts for plating

More than 100 ft. in length, this nickel plating machine alternately dips and lifts racks of parts, carrying the part through the correct sequence of baths, including the electro-plating solution





of all parts where no welds are required; others are zinc plated upon completion of the fabrication operations to prevent possible corrosion. Parts to be zinc plated are treated in an automatic barrel-type unit to which rubber-coated baskets are carried on a return pipe conveyor.

The third section in this department is the outside door hinge unit and employs elevators or bucket conveyors some of which have both horizontal and vertical movement. A feature of this section is the use of large divided storage hoppers. These are an essential part of the layout because of the variety of hinges produced. They serve to keep the various types of blanks separated and afford a means of holding blanks apart when needed.

The garnish molding department consists of two main sections in which the production of trim garnish moldings and many miscellaneous parts are centered. The smaller section is devoted to the fabrication of roof bows, compartment gutters, dash assemblies, sash brackets, cloth clips, front drip moldings, inner panel and sash cams. In the larger section are produced garnish moldings for the doors, windshield, rear quarter and back windows to suit body styles.

This department has a variety of roll-forming machines of special design used to produce a variety of formed sections developed for the turret top body. One section alone has five separate rolling mill lines and in addition a battery of 133 presses for forming, sizing and other operations. These range in size from small units to a 180-ton toggle press, weighing about 100,000 lb.

A development in this section is the salvage center, a sizable section which receives parts from every corner of the department. It has a service monorail with a developed length of some 1,200 ft. that reaches all inspection stations. Whenever a part fails to satisfy the inspector, it is placed on the salvage monorail and finds its way to the center. The salvage center is provided with suitable equipment, manned by expert mechanics who make the necessary adjustments, and returns the parts to their proper stations. Parts that are in any way spoiled are consigned immediately to scrap.

One of the outstanding features of the department devoted to control ventilator parts and assemblies is a huge nickel-plating machine to which all bright plated parts are routed by means of an overhead monorail. Wholly automatic in its operation, the machine is 120 ft. in length and represents the latest development in the art of bright nickel-plating. The final finish coat is a corrosion resistant chromium plate applied by an automatic machine 56 ft. in length. As an example of the other types of equipment that have been provided, the glass panel alone requires a battery of ten buffing lathes, and eight especially constructed polishing machines before nickel plating.

Small parts ordinarily difficult to polish are handled in a series of tumbling and burnishing operations that produce a better finish than possible with hand labor. The unit consists of a battery of thirteen tumbling barrels which remove all sharp corners. Small stainless steel, nickel, or chromium-plated parts are handled in this manner.

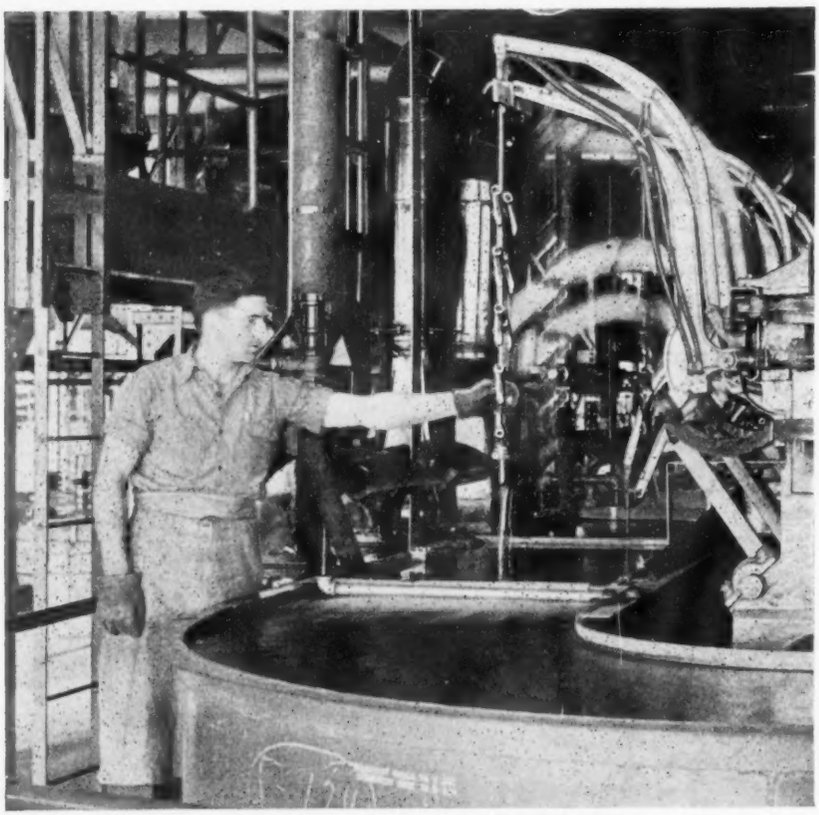
At the back of the building, the die casting unit occupies a space approximately 120 x 575 ft. and contains complete facilities for producing all the interior and exterior fittings required by the assembly plant that it serves. Complementing it is the metal alloy section situated at the head of the production lines and containing the equipment required to prepare zinc alloy charges for the die-casting machines.

The two units combined produce a wide variety of parts including inner and outer door handles, deck lid and trunk handles, trunk hinges, crank handles for window regulators and ventilators, and medallions of various sorts.

Some 450 tons of zinc is maintained constantly in the metal-alloy section to assure the continuity of operation at all times. Under the careful supervision of the plant metallurgical laboratory, alloy compositions are held to established specifications. Four large melting furnaces are required to keep the die-casting machines going; the hardener which is added to the molten metal is prepared in two separate crucibles.

Following the pattern of other departments in the plant, the die-casting section is completely conveyorized. Other equipment includes two large nickel-plating machines. Because of the extensive use of plating equipment throughout the plant, a laboratory that maintains constant supervision over the plating solutions has been established.

All chromium plating done in this department is handled by one machine, centrally located and connected by monorail to the various inspection stations serving the nickel-plating operations.



Chromium plating of all body fittings is done in this 54-ft. automatic machine. This equipment is served by monorail from the various inspection stations following the nickel-plating operations

CHIP BREAKERS FOR PARTING TOOLS

HARRY CRUMP
Schenectady Works Laboratory, General Electric Company

CHIP CONTROL grooves used principally in connection with turning and boring tools as described in a recent symposium (*AM*—Vol. 82, pages 54, 108 and 178), can also be applied to advantage to parting tools. These tools, often called cut-off tools, most commonly are made with the bit extending straight out from the shank in "center cut" and in right- and left-hand styles.

For curling and breaking chips on turning and shaping jobs, most mechanics grind a small lip or chip curler in the top of the bit extending from the cutting edge back approximately $\frac{3}{8}$ in. and approximately $\frac{1}{8}$ in. deep as shown at *A* in Fig. 1. A few, however, prefer a large radius as shown at *F*. Size of the radius varies somewhat according to the material being machined, and the larger radius usually works better when the tool is being used in a shaper. When brass is being machined, a flat-topped tool usually performs to better advantage than one having a lip.

Where tipped parting tools are used, it is frequently better to leave a step of shank material above the top surface of the tip when it is brazed into the shank, forming a ledge against which the chip will ride as it comes off the work, as indicated in Fig. 1 at *B* and *C*. The tool shown at *A* indicates the possibility of providing a chip curler ground into the tip of the tool, as well as a step ledge at the rear of the tip. This is used only where much difficulty is encountered in controlling chips.

When using parting tools to cut various diameter holes in flat plate stock, as in trepanning operations, the lower end of the bit is ground away for clearance and chip room, while the top surface is left flat or ground with a lip according to the material being cut, as at *D* in Fig. 1.

When parting off rims of large wheels on boring mills and using two tools, one tool in the right-hand head and the second in the left-hand head, the lead tool usually is ground with an angle on each corner to allow only the center of the bit to cut, as at *K* in Fig. 2. In this case, a lip also is ground in the top of the tool to curl the chips as at *I*. The follow-up parting tool in the opposite head is left square on the end, but the same radius is used on the top in order to curl the chips.

The leading tool *K* is fed into the work first, and after a groove approximately $\frac{3}{32}$ in. deep is cut, the second tool is started. This tool, of course, cuts two narrow chips, one at either side of the slot as shown at *L*. The same feed per revolution is used for both heads.

While tools *A, B, C,* and *F* in Fig. 1 are suitable for cutting-off round stock in lathes, a better tool for production work is that shown at *H*. When using this tool, the machine is run backwards and the parting tool is placed upside down in the tool post. This method is excellent from a chip-control standpoint, as the chips fall out of the grove from under the tool instead of piling up on top. Deep cuts may be taken when using this tool without danger of breakage, as the tool has a tendency to rise and clear itself rather than to dig into the work and chatter as is often the case when a straight cut-off tool is used. Fig. 3 shows the usual method of setting-up such a tool. A small chip-curler is ground in the cutting surface.

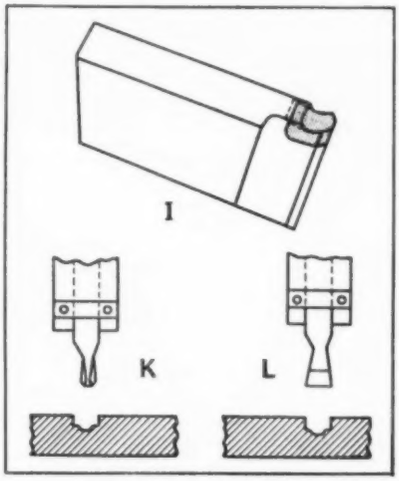


Fig. 2—Special grinding for the lead tool where two parting tools are used in opposite heads on a boring mill is shown at *I*. Here the corners are ground off so that only the center portion of the lip is cutting. The groove cut with this tool is shown at *K*, while the set-up for the following tool is indicated at *L*

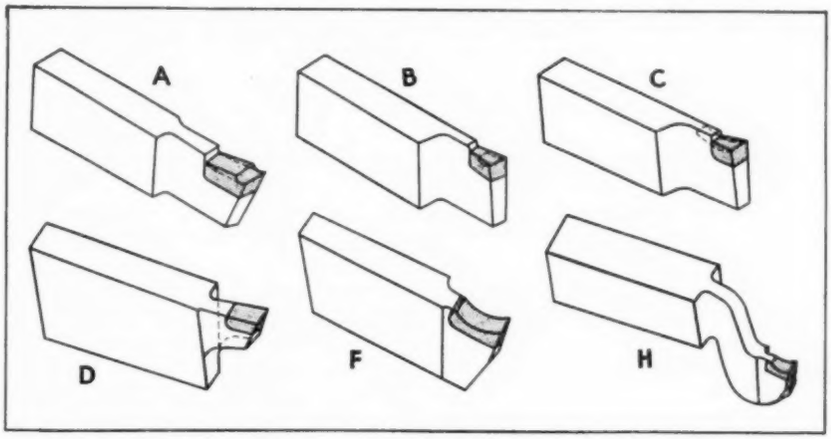


Fig. 1—Parting tool shown at *A* is of the "center-cut" type, while those shown at *B, C* and *F* are right- and left-hand types. The tool shown at *D* is ground especially for trepanning operations. Round stock can be cut-off to advantage in the lathe when using the tool shown at *H*

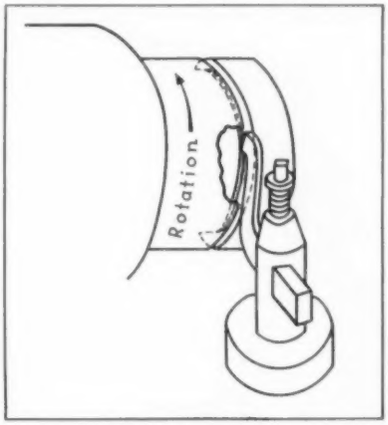
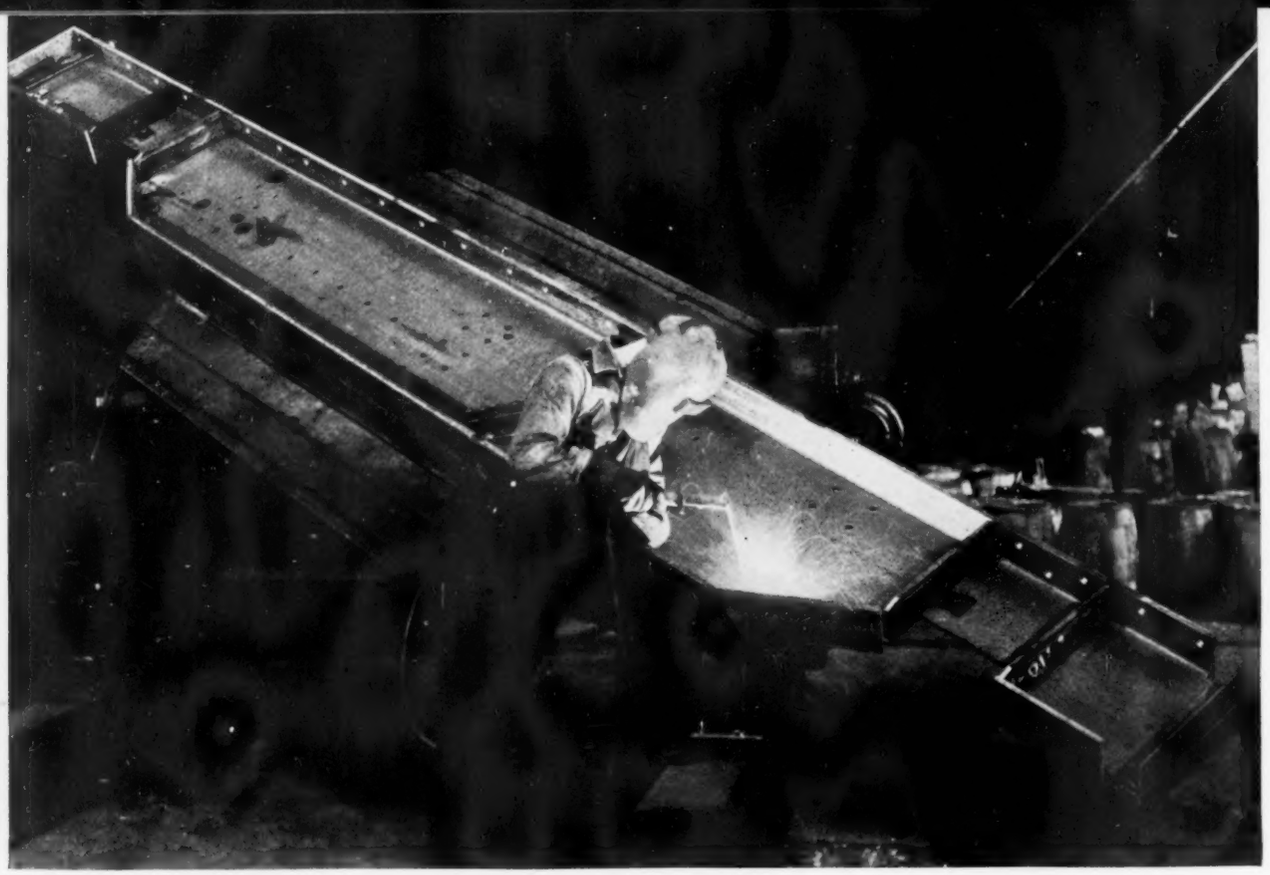


Fig. 3—The bent parting tool shown at *H* in Fig. 1, and recommended for production parting operations in all types of lathes, is shown here



Savings of 10 to 30 per cent are made possible by the use of machines that quickly position the work

Commercial Weldery

Briefed from a paper which received the Grand Award of $13,941 in the $200,000 program sponsored by the James F. Lincoln Foundation

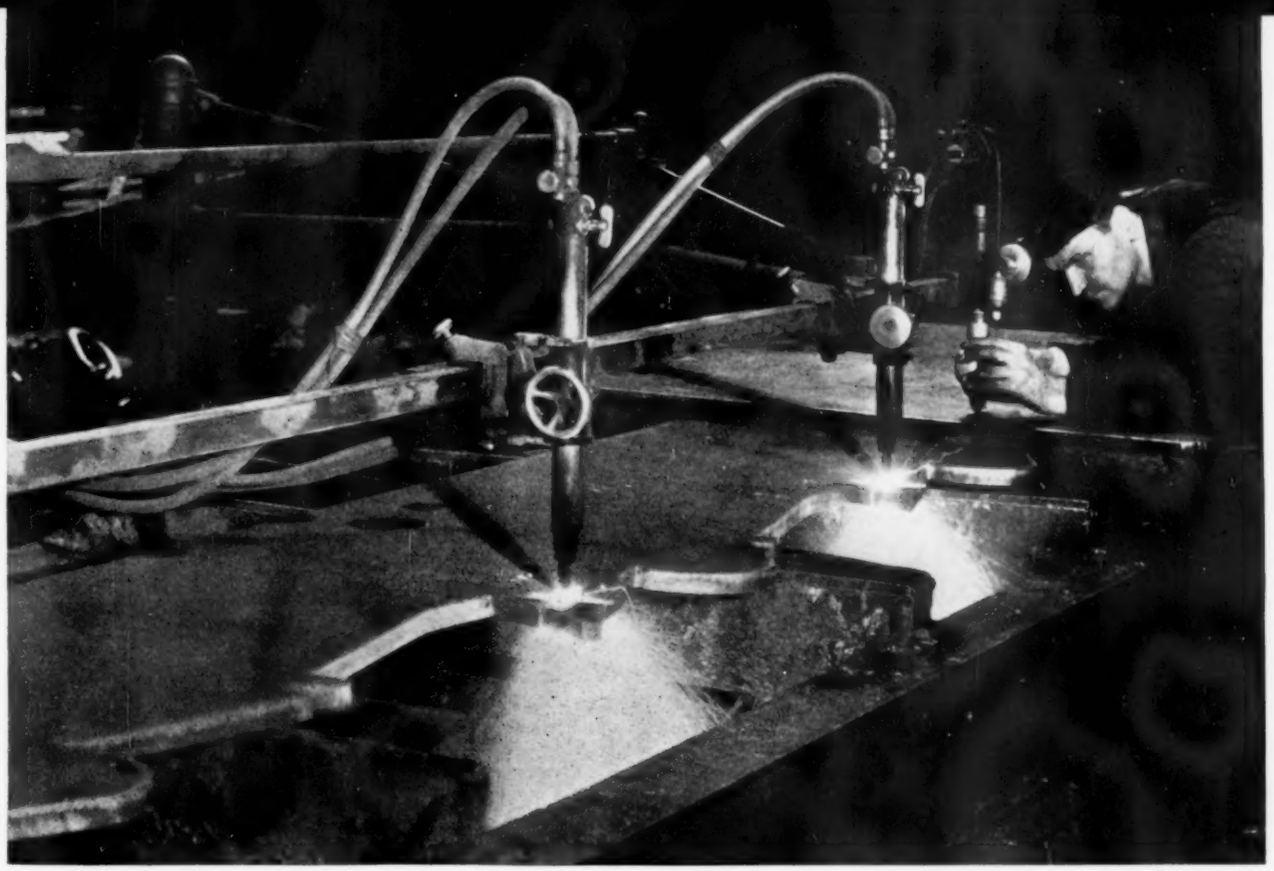
A. E. and M. W. GIBSON
The Wellman Engineering Company

REGARDLESS of the knowledge of the subject, and the enthusiasm for it among subordinates, little progress can be made unless an executive in the organization is keen for welding. The co-ordination of engineering and fabrication, the necessary expenditure for equipment and supplies, the ceaseless drive for efficiency in design and production, can only result from executive support. The lack of these essentials spells failure, or at best, produces but mediocre success.

Operators are obtained in two ways: by training inexperienced applicants, and by hiring men who have had previous experience in other plants. In the former case, preference is given to a high school graduate who has had some machine tool experience. It is only when the operator can butt weld two $\frac{1}{2}$-in. plates, each V'ed to 30 deg. without objectionable inclusions, gas pockets or lack of penetration, and produce true fillet welds in both flat and vertical positions which shall have the required tensile and ductility properties of filler metal, that he is permitted to perform our more important welding operations. The time needed to acquire sufficient skill is from four to six months.

When a rush of work requires the employment of experienced welders, we advertise by passing the information of our requirements through employees or through the newspapers. When a welder applies, we ask him if he is willing to make a qualifying butt weld test. The nick-break test is made in the presence of the applicant, and if the work is of such a nature that our supervisor feels that with a little practice the applicant can perform the test successfully, he is allowed further tests. This method of qualifying an operator has been questioned many times with the statement that a nick-break test does not measure either tensile strength or ductility. We have found, through years of experience with tensile, bend, fatigue, impact, hardness tests, and metallographic investigations, that the nick-break test is by far the most difficult one to pass. Our judgment of an operator's ability from a nick-break test has not failed in over five years use, and too, this type of test can be made at practically no cost to the company, and of but one or two hours of the applicant's unemployed time.

Some of our operators have been qualified by the National Weld Test Bureau for welding unfired pressure vessels with plate thickness from $\frac{5}{8}$



Two parts are made at once in a multiple gas cutting machine thus cutting the cost of this operation in half

to 1½ in. These welders have built a large number of pressure vessels under the supervision of insurance companies.

In view of the developments constantly being made in welding equipment, we believe five years is the extent of time a welding machine should be used. Not that the equipment is worn out in that period—we know of many welding machines which have been in continuous operation for ten or twelve years—but that the developments perfected make it advisable to adopt this program. All our welding machines are depreciated over a period of five years and in turning them in on new equipment, no book loss is sustained.

It is our experience that d. c. welding machines are so sturdily built that little or no upkeep is necessary over the period they are kept in service in our shop. They are, however, periodically inspected by our electrical service men.

While we know that welds made with bare wire are satisfactory in many fabrications not subjected to high stress, we have ruled out such wire solely because of the possibility of it being used in structures where shock and high stresses will be encountered. The electrode cost is so small a part of the over-all cost of welding that the added ductility secured by using heavily coated electrodes justifies the small extra expense. We stock a wide range of electrodes from 5/32 to 5/16 in.

To facilitate welding, we provide a number of large heavy cast iron tables having suitable bolt slots for set-up work and for clamping work preparatory to tacking. A number of lighter section tables are also available, which can be readily moved. These are used as supporting structures for jigs and fixtures. Tables are an indispensable facility for a properly constituted weldery. We also have several cast iron floor plates set in concrete, which are used for setting up large structures.

In the preparation of steel for welding, shears, and power or friction saws are required. Heavy sections unsuited for mechanical cutting are shaped with a gas torch. Even with light sections a torch is necessary where contours vary from a straight line. In addition to the required number of hand torches, it is desirable to have one or more mechanically operated gas cutting machines. The fixed type with pantograph motion and the two directional travel carriage type are equally serviceable. In addition, at least one portable gas cutting machine to operate on a portable rail for straight line cutting, or on a radius arm for circle cutting, is of great service.

When a large number of gas cut parts is to be made, multiple cutting torches can profitably be used on mechanically operated machines, thus materially reducing the labor cost per piece.

Today, no properly constituted weldery can afford to be without positioning machines. The larger machines, for large and heavy work, should be power operated. The smaller sizes may be hand operated.

A structure, once fastened to a positioning machine, can be quickly revolved into proper position for welding, thus eliminating the delays incident to desired setting with the use of a crane. In addition, "fast" electrodes can be used without danger of undercutting, and symmetrical fillets can be obtained. Savings in welding time of from 10 to 30 per cent are regularly effected, and overhead cranes—no shop has enough of them in busy periods—are released for other work.

The shaping of cylindrical and conical structures is usually performed on power driven bending rolls. We have, however, found a bending brake more advantageous for conical work, if the cone is composed of two or more longitudinal plates.

Our bending rolls are not heavy enough for some of the work we produce, and often it is necessary to have plates rolled in plants hundreds of miles away. We sometimes order plate from the mill, rolled to size before shipment to us.

The use of rollers is advised for welding large cylindrical work. The 11 ft. 8 in. diameter water cooled shell illustrated is mounted on supporting rollers. Longitudinal and circumferential seams may both be

welded in one setting, without continuous overhead crane service. Roller supports, such as shown, are low in cost as they consist only of channels tied together with plates and the necessary bushed rollers and supporting pins.

Two other methods for maintaining alignment of cylindrical and conical sections are used. In one case a spider with adjusting screws rounds the cylinder and maintains the true size during welding of the longitudinal seams. In another adjusting straps and bolts are used to align the conical and cylindrical sections for welding.

The extent to which proper tools for bending metal eliminate welding labor, is too little appreciated.

By the use of rollers, cylindrical work can be handled without constant crane service and welded continuously

The brake illustrated has a capacity of 13 ft. 6 in. of ½-in. plate (10 ft. 6 in. between housings) and is shown bending a ½ in. x 11 ft. 2¼ in. plate into a channel shape. Two strokes of 13 ft. 6 in. of ½-in. plate (10 ft. butt weld, which would be required if the design called for the welding of the detail with three plates. The saving in time and labor cost is obvious. Note that the brake is a completely welded structure.

Another type of power tool for bending material of heavier sections than can be handled on plate brakes is the hydraulic press. Not only is this tool useful on heavy work, but also on plate of lighter sections when bent edgewise.

Unfortunately, in most welderies there is too little realization of the importance of welding fixtures as aids in reducing labor. Much thought and study should be given to the design of suitable fixtures for aligning metal to be welded, both from the standpoint of interchangeability of parts, and of reduction of cost.

Fixtures should be of sturdy construction so as to prevent distortion due to localized welding heats, and should provide means for quickly setting and clamping the various parts of the structure.

There are certain classifications of work which demand special facilities and equipment which are unnecessary in other lines. If the main product of a weldery is class one pressure vessels, facilities for thermal stress relief and heat-treatment are essential. Every weldery has occasion to stress relieve thermally some portion of its products.

For heat-treatment, a suitable furnace, either gas- or oil-fired, is needed. In almost all industrial localities, heat-treating equipment is available as a commercial service to the trade, and if the quantity of work to be heat-treated is not large, it may be best to depend upon other companies to do the work. We find that two oil-fired furnaces, required for our forging and flanging work, are a great advantage to us in heat-treating certain of our welded products. At times we have much larger pieces to stress relieve than our furnaces will accommodate, and we send this work to a commercial heat-treating company or to one of the large steel foundries in our district. For best results, the furnace should be equipped with a thermostat to control the temperature.

With some large weldments, where grain refinement is desired, the heat-treatment is done in pit annealers.

Investigation and research have become necessary functions of a successful weldery. Whether a shop employs one or one hundred welders, it is important to know the quality of an operator's work. To qualify a welder for code work, necessitates the use of a testing machine for determining the ultimate and yield points. The investment required to enable a weldery to do its own tensile testing would not be justified in a small shop, as testing laboratories are available whose charges are moderate. In large organizations, and particularly those where other tests are regularly called for, the cost of a tensile testing machine can be justified.

When research work is carried on, and a research department is maintained, other equipment such as fatigue, impact, and hardness testing machines, is used. Then, too, metallurgy has become so generally recognized as a science of importance to welding, that microscopes for study of grain structures have become a necessity.

While machining facilities are not essential to a weldery, and many successful ones operate without machine tools, there is a great commercial advantage in being able to fabricate welded equipment and to machine it. There are many instances in which a complicated structure may be handled best by building it in sections and machining certain parts before total assembly and complete welding. Details which require bosses made from rolled steel bars are generally much cheaper in finished cost when the bosses are cut off in lathes and rough bored in the same setting. In other cases, satisfactory results and lowered costs are made possible by doing the necessary machining before welding.

Cost of Equipment

Since the average weldery has been developed as an addition to a previously organized metal fabricating company, a complete analysis of capital equipment will not be attempted. Also there are many successfully operated welderies which purchase steel cut to order, or carry stock sizes which are prepared for use by gas cutting. It is possible to carry on extensive welding operations without saws, shears, tables, floor plates, or other auxiliaries. The total capital investment is dependent upon the scope of work to be attempted and the capacity of the plant. The total cost of the following items of equipment is $25,205: arc welding machinery; ½ in. x 10 ft. 6 in. (between housings) plate brake; pantograph mechanical gas-cutting machine; two directional travel mechanical gas cutting machines; portable gas cutting machine; large power operated positioning machine; small hand operated positioning machine; hand gas cutting torch.

Many engineering companies overlook the large savings made possible by changing over small mechanical details from castings to welded construction. Too often these details are given scant consideration because of the small amount of money involved in each item, and attention is centered almost entirely on larger pieces. During the course of a year we produce thousands of small miscellaneous details in welding, and

the cumulative saving is surprisingly large.

The tendency is simply to use the cast design drawing and change the construction to welding. This is almost always a mistake from a cost standpoint. Thought must be given to labor reduction through the use of rolled sections, and to straight line construction, which permits low cost in the preparation of the material for welding and of still greater importance, elimination of welding labor.

A cast and a welded corner bracket is produced in lots of 50 or more at a time. Without considering the cost of the pattern, the saving of the welded part over the cast design is 21 per cent. This saving resulted from the use of a rolled angle and a plate with punched holes, which was bent to the required shape. The welding was thus reduced to a minimum and was done with the parts assembled in a fixture. The comparative shop costs of the cast and welded brackets are as follows:

Steel Casting 41 lb.			$5.95*
Welded:			
Shear	3.5 min.	$.084	
Punch	1.4 min.	.034	
Bend	4.0 min.	.133	
Fitting	8.9	.214	
Gas Cut	11.0 min.	2.745	
Weld	62.2 min.		
Grind	7.4 min.	.178	
		3.388	
Material		1.320	
Total Welded Cost			$4.71
Saving in favor of welded design			$1.24
Saving			21 per cent

* Pattern cost not considered.

In fabricating plants thousands of such parts can be found which lend themselves to welding with equally startling savings. Only lack of inspiration and thought on design prevents their transformation into the more economical welded construction.

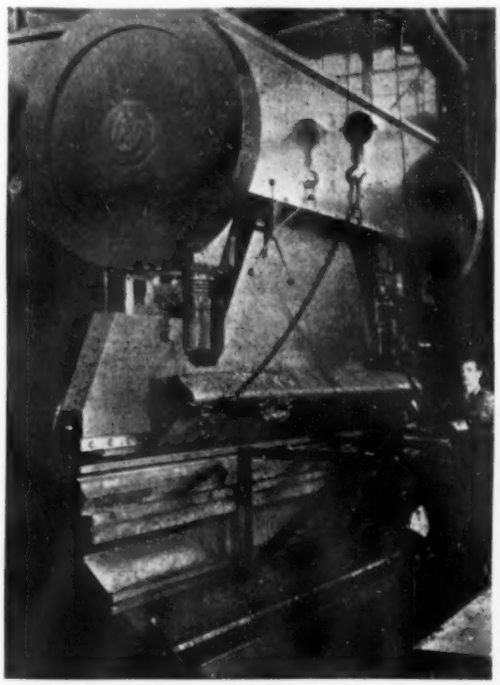
One of the functions of an engineering department is to specify exactly the size and shape of every weld to be made. It is not the duty of a welding foreman or operator to guess the stress to be applied to any weldment. Therefore, a suitable method of designating welds should be adopted and used on every drawing sent to the shop for fabrication. Our company has adopted the American Welding Society's standard welding symbols. Copies of these are given to every draftsman and to the shop. Guess-work is eliminated and each weld is made in accordance with the calculated weld strengths determined by our engineers.

With the advent of the new low alloy, high strength steels and their advantages of high tensile strength, high elastic ratio, and resistance to abrasion or corrosion, the problems of design and welding fabrication become complex. For years, we had been disheartened by the costly failures of certain castings in clam shell buckets when these were subjected to severe tensile, bending and impact stresses. The constant increase of metal sections where failures occurred did not eliminate the breakage. The designs were such that in the castings planes of heavy metal were joined at right angles to lighter sections with heavy fillets at the angle. All the hazards of foundry practice were encountered in making these castings. The use of large dry sand cores prevented natural shrinkage of the cooling metal. Cracks developed in cooling. Shrinkage occurred, causing cavities which were hidden by the outer crust of metal. Segregations produced sections far weaker than the analysis of the heat would indicate. The result was failure in service, complaint from the customer, expense of replacement, and, of far more serious import to a manufacturer, a "black eye", making future sales to the customer extremely difficult.

We were welders, we had a creditable array of imposing low carbon weldments to point to, and now we could obtain a new steel possessing 60,000 lbs. per sq. in. yield, 90,000 lbs. per sq. in. ultimate strength and over 20 per cent elongation in 8 in. If we could redesign the faulty parts, build them by welding, using this steel, we felt certain the breakage would be overcome.

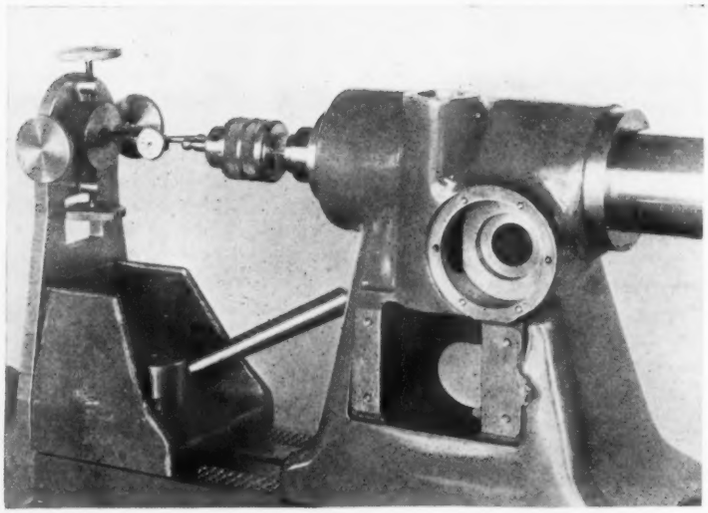
Our experience was so encouraging that we carried on an investigation of all the new low alloy steels as they were brought out. As we became familiar with the technique of shaping, welding and heat treating of low alloy steels, and as our engineers, striving to increase the strength of equipment and reduce its weight, learned the short cuts in fabrication cost, a wide and varied array of structures became an inviting field for welded high strength steel.

A striking example of the advantage of the use of low alloy steels is found in a recent proposal to an eastern railroad desiring coal loading equipment. The customer advised us that although our design was acceptable, the weight of three machines, built of low carbon steel, was too great to permit their use on the existing pier which had been designed to carry lighter equipment. Our knowledge of the use of high strength steels, coupled with welded mechanical equipment, permitted a design incorporating a chromium, phosphorus, copper steel in heavy rolled sections, resulting in a weight reduction of 20 per cent.



A plate brake is a profit maker in any weldery. Over 11 ft. of weld are eliminated by this machine on the job shown

A saving of 21 per cent was made by changing the cast corner bracket at the left to the welded design shown at the right

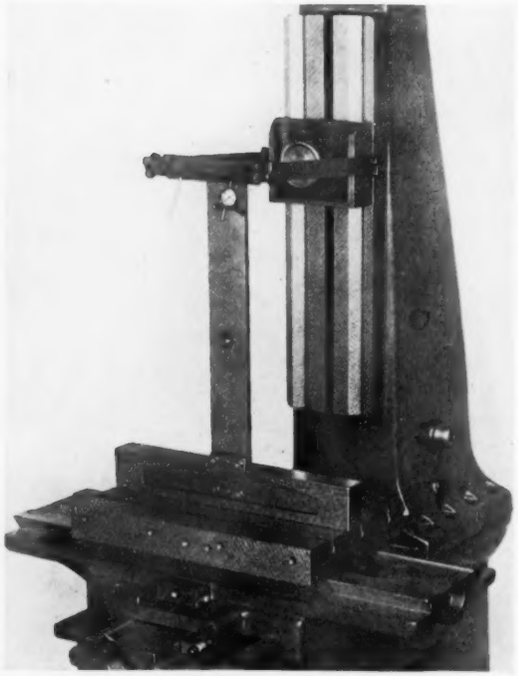


Jigs

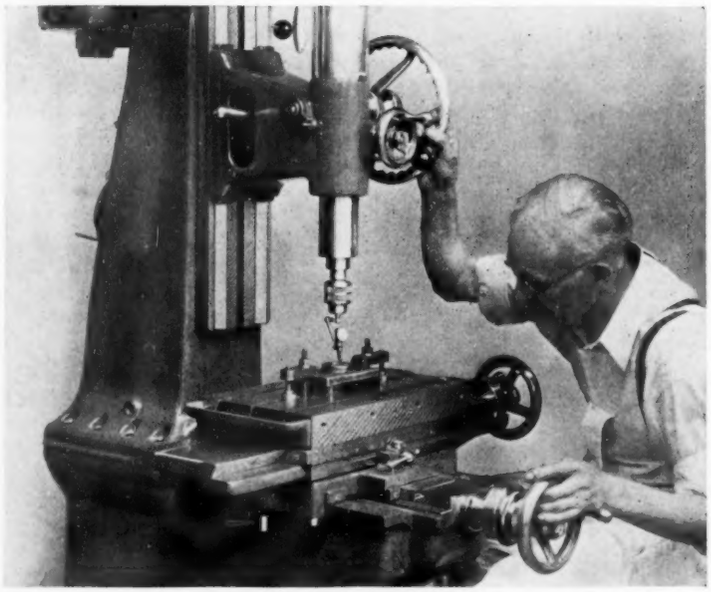
FOR A

JIG BORER

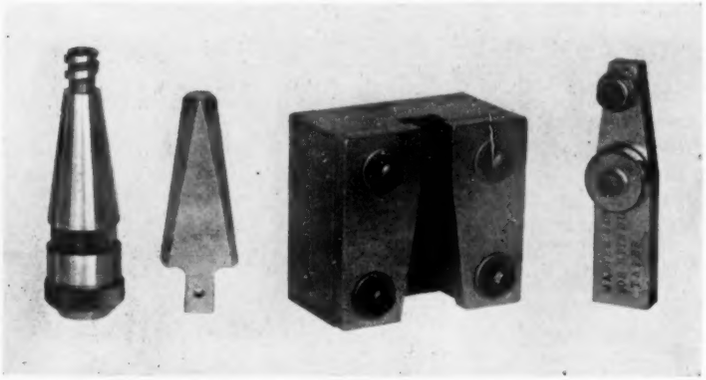
Controlled by fine adjusting screws, the hardened bore is carefully aligned with the spindle by means of a dial indicator. After setting the hole so that the pointer reads uniformly all around, the head is moved about a foot away from the set gage and the spindle is brought forward until the indicator again engages the hole. If the reading is still uniform it is known that the spindle will bore around the same center at any height



With the indicator first on one side the square blade and then on the other, the squareness of the column to the table is checked. To make doubly sure of the set-up, the square is reversed and the readings are repeated. Note the special construction of the square which permits fine adjustments

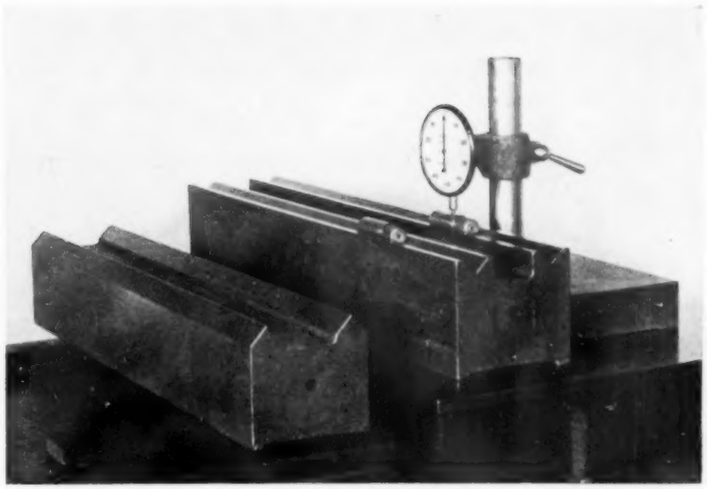


Spindle accuracy is again checked after final assembly. This test closely follows actual operation of the machine. Here the head is set at various positions while the pointer on the dial indicates whether the spindle bores uniformly



The spindle taper is based on the master gage at the right in which two hardened steel rollers determine the angles. From this master is made the female gage next in line. To it is fitted the internal gage, next to it and the chuck holder at the extreme left. Note that the internal gage is not a conical plug, but is ground to knife edges so that a slight deviation from the true taper will show up as shake when the inspection is made

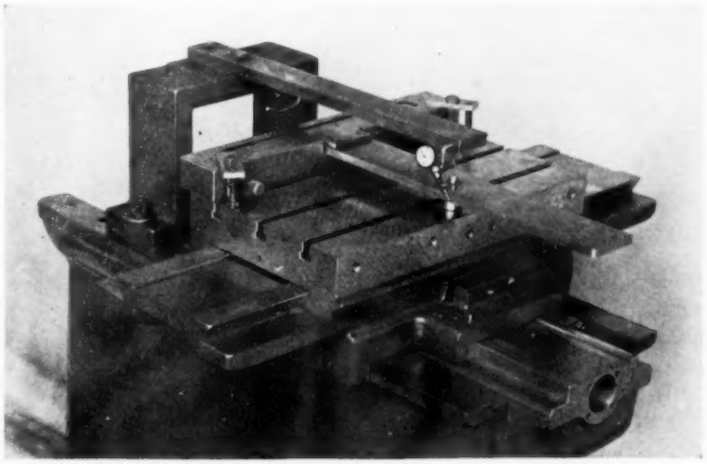
II Some machine set-ups used in finishing parts for the Moore jig borer were shown recently in these pages. For checking the accuracy of these operations, a system of inspection has been developed which in general simulates as closely as possible the conditions that will be met in using the completed machine. Precision dial indicators are used in practically all of these steps as the accompanying illustrations will show.



Accurately sized plugs are used to inspect the master V gage. The male gage which is fitted to the master is used to scrape the finished columns. The spindle heads in turn are scraped to the columns in order to insure a good bearing and a uniform fit

Precision of the hardened and ground leadscrews is measured by Jo blocks. The table is tranversed and the positions noted with an indicator against the blocks which have been cleaned and carefully wrung together. Vernier scales are read at each setting

Ball bearings to be preloaded at assembly are tested under load. Spring pressure in a special arbor supplies the load while indicators show eccentricity and run-out. Here again working conditions are closely approximated during inspection



With the table moved crosswise and the dial indicator clamped to the rear hook, the square is set with its base parallel to the table. Then the indicator is transferred to the position shown while the slide is moved longitudinally. Squareness of the two table movements is guaranteed by this test

PUBLIC RELATIONS *for* **INDUSTRY**

Glad to Know You

Employees are gaining a greater insight into company operations and management is getting a better understanding of its workers as exemplified in the ten cases given below

BURNHAM FINNEY
Editor, American Machinist

WHAT specific measures are companies taking to improve their relations with employees and with the public? What are they doing to make the public conscious of industry's importance to the community and to the nation? Are many companies stepping up to their responsibility to interpret better their policies to their own employees as well as to outsiders?

In an attempt to secure answers to some of these questions and to be able to pass along helpful suggestions to *American Machinist* readers, we have talked with a number of companies in the metal-working industry and out of it. From those talks have come useful ideas which you may find applicable in your own company. Some of these ideas are listed on this and the next page.

COMPANY A, with a large plant in New England, has recently started to send a series of monthly letters to all employees to acquaint them better with what the company is doing. The letters are termed part of a "Know Your Company" program. The latest letter is devoted exclusively to the loyalty and teamwork shown by the men of the New England division during the recent hurricane and flood. The letter is in the form of a four-page pamphlet with pictures of the storm damage at the plant. On page 1 is a letter from the vice-president to the president giving a timetable of the hurricane events as they affected the factory and saying, "I believe that every worker, officer and stockholder should know of the extraordinary loyalty shown by the New Bedford staff during the hurricane. I am not much of a story writer, so I'll let the facts speak for themselves." On page four is a message of thanks to all the men from the company's president.

COMPANY B has made it a practice since July, 1927, to report annually to its employees on its activities. The initial report, exceptional for its day, was a brief summary of subjects immediately relating to employees, such as data on the relief plan, pension plan, home ownership, safety and health. The report has increased in size and in the subjects covered. The last issue had in condensed form some of the tabulations sent to stockholders, including data on the volume of business and orders on hand. On subjects of special interest to employees, the report was more detailed than that to stockholders.

COMPANY C, which employs about 150 men, has a general manager who knows every man in the shop and who is not only the boss, but also the counselor and friend of all employees. He holds their confidence because he gives them a square deal, even when it may be detrimental to the interests of the company. Example: One of his skilled machine operators was greatly disturbed because his mother-in-law cowed his wife, and there seemed no way of putting an end to this "bull-dozing" so long as they lived closely together. The operator "spilled" his troubles to the boss who arranged to get him a job in another city, thereby enabling him to remove his wife from under the nose of her mother. Another operator was doing poor work because his wife was running around with another man. He placed his problem before the boss who, after reviewing the facts, helped him get a divorce. Needless to say, this shop has no serious trouble with men. The *esprit de corps* is excellent.

COMPANY D, also a relatively small concern, has found that its men are eager to learn the ABC's of many subjects which they read about in the papers and hear about on the radio, but actually don't understand. The manager of the company calls the entire force together out in the shop at the noon hour now and then and personally talks informally to them on various topics. One time he may tell the men how a bank operates, putting the description into elementary terms. Another time he may explain how a manufacturing company finances itself. Still another time he may speak on the first principles of economics and of the private enterprise system. These meetings, at which the men ask innumerable questions, have helped

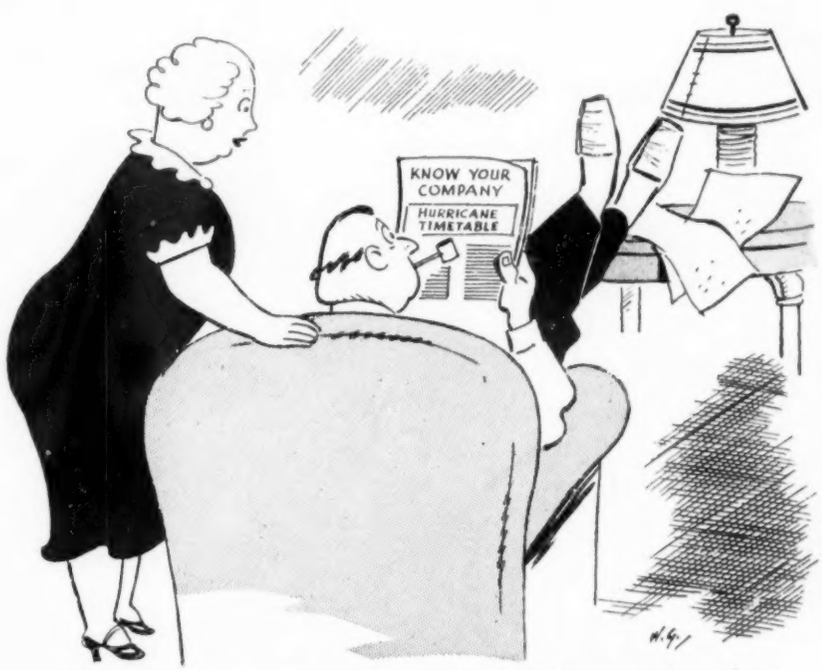
tremendously toward a "meeting of minds" between the management and the rank and file of employees.

COMPANY E uses its monthly magazine addressed to all employees to explain in a series of articles the ABC's of company policies. One of the articles explains that the door to opportunity is always open in the company. As proof the fact is cited that various officers and key executives started from lowly positions. On the board of directors are men with 190 years of combined experience in the operation of the business. They began work years ago as machine hands, clerks and draftsmen. In one issue of the magazine the management outlined its responsibilities. At the end of the statement it declared, "You, too, have a responsibility. To every other employee, to the company. Most of all, to your family and yourself."

COMPANY F makes it a habit to bring its employees together in large mass meetings to explain the situation whenever a major change occurs affecting company operations. The company has around 10,000 workers in several cities and the staging of these meetings is no mean task. Recently some fundamental changes were announced in the industry's marketing and pricing policies. The company immediately scheduled meetings with all employees, explaining in simple language what the changes were and what they meant to the company and how they affected indirectly each employee.

COMPANY G has set aside a large room in a building at the entrance to its plant gate where the men may gather at the noon hour and smoke, listen to the radio, play cards and play pool or billiards if they wish. This action has taken many men from their former pastime of loitering along the street or around the gate and given them something to do which they enjoy.

THE NEW YORK CENTRAL Railroad is a large industry in many cities through which it operates, particularly in the smaller communities. It is endeavoring to make its importance known by signs hung in its stations telling what it means to that particular city. We quote from the sign in the Sidney, Ohio, station, "The New York Central System is a major industry of Sidney. It has 22 employees with 58 dependents. Ten own their own homes. The annual payroll is $28,000. The road pays annual county taxes of $17,303. It pays annual county school taxes of $10,423." That is one way of informing the public and local citizens of what one industry means to a city.

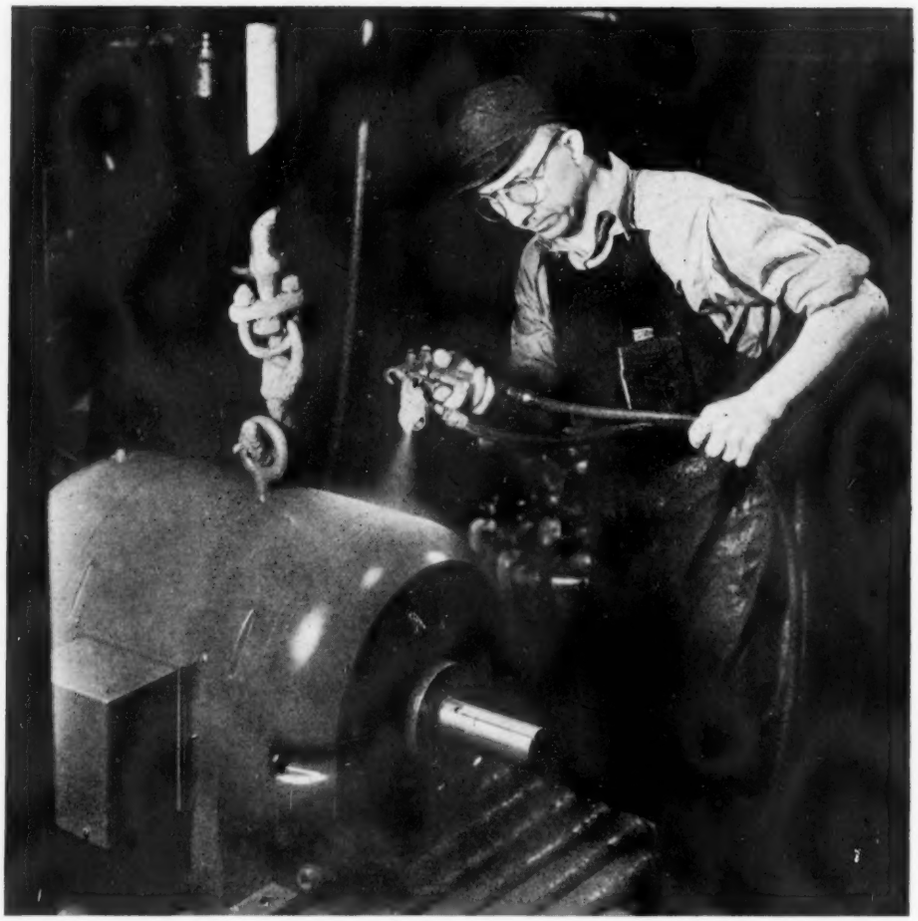


Many companies tell employees interesting and important facts about company business and employee activities

BETHLEHEM STEEL COMPANY is devoting the current number of the Bethlehem Review, which goes to all employees, to presenting some of the things which the management and the workers have accomplished in "making our company of outstanding service to the general public." The history of the company's growth, with the outlook for the future, is included. The company's relationship to other industries from which it purchases supplies is outlined. Bethlehem's part in community life and the management's huge job in keeping equipped to serve Bethlehem's various markets are dealt with. The fact is brought out that the personnel is active in service clubs, welfare societies and fraternal bodies, and the company is a supporter of hospitalization, public health, education, recreation and other civic activities. For more than a decade the corporation has had a pension plan for employees and the employees relief plan paid out more than $1,000,000 in the past year. A novel example of employee and public activity at Steelton, Pa., is cited. During the short-work conditions of the depression a public park was built at Steelton by the volunteer labor of Bethlehem employees and other citizens, providing permanent recreation facilities. The Review comments that the value of a wide range of community work is recognized, but "the fundamental general welfare depends on good business conditions, good markets, and the uninterrupted flow of production."

COMPANY H employs 250 men and manages to maintain an amiable relationship with its employees without indulging in paternalism. Whenever earnings warrant, it gives the men a bonus at Christmas. It grants vacations with pay every summer. If any man is dissatisfied with his pay rates, he goes direct to the factory superintendent who conducts immediately an informal conference in which the worker, his foreman and the superintendent participate. Matters usually are straightened out in a hurry by that process. Whenever an employee is hurt or is ill for any length of time, the president drops in to have a visit with him at his home every few days. This isn't a coldly calculated call for the purpose of winning the employee's favor, but is an expression of genuine concern on the part of "The Boss." The men know the difference. About the time of the Boss's birthday every year, the men in the shop "throw" a party for him. It is very informal, at the end of the work-day, and the company foots the bill for the food and drinks.

Needless to say, this plant is free from labor trouble.



As compared with some of the other finishing processes, the spray gun can be used economically for finishing large or small lots of a wide range of products. With this aid, any number of colors and practically any type of finish can be applied

How Shall I Finish?

Many factors influence the selection of methods for applying the quality surface coatings which modern products must have

DR. GUSTAVE KLINKENSTEIN
Vice-President and Technical Director, Mass & Waldstein Company

IN SELECTING the process to be used for lacquering, enameling or japanning a metal product, the manufacturer usually has a wide choice. Almost any product can be finished in any one of several different ways. Quality and durability of finish do not, as a rule, enter into this problem. When proper finishing materials are used, a satisfactory finish usually can be obtained by any practicable method. Speed of production and finishing cost per unit, however, will vary widely with the process employed for applying the finish.

In making this selection, several factors must always be taken into consideration. These include:

SIZE, SHAPE AND WEIGHT OF PRODUCT—Ordinarily products such as buttons, long sheets and automobile engines must be finished by quite different processes, but a product of small size, simple shape and light weight can be finished by any one of several processes.

VOLUME OF PRODUCTION—Some finishing methods are applicable only where the output is small; others are economical only with mass production; still others are suitable for use with either large or small outputs.

CHARACTER OF FINISH—The number of colors used for finishing each unit, the kind of coating (whether smooth, wrinkled, or of some novel type), and also the number of different colors in which the units are to be offered will all effect the choice of the finishing method.

FINISHING FACILITIES AVAILABLE—Naturally, a manufacturer who has certain finishing facilities available will use them, if possible, for finishing a new product. But not in-

frequently economy will be served if different facilities are installed for finishing the new product.

As is evident from a glance at the accompanying table the spray gun or air brush, which is operated by compressed air on the atomizer principle, is by far the most important instrument used for lacquering and enameling. In the hands of a competent operator the spray gun knows few, if any, limitations. It is being successfully used for finishing every size and shape of product from hooks and eyes to Pullman cars. It can be used economically for finishing a few products a day and also is widely employed in mass production. With its aid, any number of colors and any known type of finish can be applied easily and it can produce many decorative effects that cannot be produced by any other process. As compared with some other finishing processes, the first cost of a spray gun installation is low and, with proper safeguards, the fire hazard is small.

Automatic spraying is applicable when identical products, large enough to be handled individually, are turned out in large numbers. An installation for lacquering cylindrical lipstick holders automatically illustrates the principle of the process. In this installation, the lipstick holders are carried on vertical, rotating spindles which are mounted on a large turntable. The turntable revolves, carrying the holders past an automatic spray gun. As each holder passes it the spray gun emits a jet of lacquer which covers the holder completely. The turntable then carries the lacquered holders through a drying oven and, when they emerge, they are dry enough to handle. Capacity of this equipment is several thousand units per hour.

Automatic spraying machines must be designed individually for finishing a given product. Their first cost naturally is comparatively high and can be justified only by large production. While many of the installations are simple in character, like the one described, as many as eight automatic spray guns have been employed in order to provide multi-colored finishes or to coat every part of complex surfaces.

Automatic spraying also is used for coating large, flat sheets of metal. In doing this work, one or more automatic spray guns move back and forth above the work, which travels continuously forward. However, roller coating, described later, is more generally employed for doing this class of finishing.

For finishing in a single color a limited number of products that are not too heavy or too bulky to handle, manual dipping is sometimes used. In this process the finishing material is poured into an open tank, which must remain open while the work is being carried on. The parts are dipped into the finishing material by hand and then are set aside, or placed in an oven to dry. Small products are dipped in baskets and may be poured out on vibrating screens to dry. Larger parts are placed on racks or are handled individually. The advantages of the process are its simplicity and low first cost. Its disadvantages are: the fire hazard constituted by the open tanks, the contamination of the finishing material by shop dust and dirt, and the excessive loss of solvents through evaporation. Because of these disadvantages the tendency is to favor other finishing methods where possible.

Mechanical dipping processes may be intermittent or continuous. In the intermittent process, the products either are dipped mechanically into a tank containing the finishing material, or the products are held stationary and the tank itself is raised and lowered. For certain products the latter method is preferable, because the products are not subject to vibration and the resulting finish is less liable to be uneven or wrinkled. The work of handling the products before and after dipping may be done manually or mechanically, as desired.

This finishing process is economical when the products to be finished are: (a) easily racked; (b) comparatively simple in design; (c) turned out in considerable quantities; and (d) finished in single colors or very simple color combinations—each color requires a separate dip.

The first cost of the equipment may be greater or less than that of a corresponding spraying installation, depending on circumstances, but the labor and material costs should be less per unit. By suitable mechanical arrangements the objections which apply to manual dipping largely can be overcome.

In continuous mechanical dipping, the products are carried by a conveyor, either on racks or individually according to size, through a bath of the finishing material and then into an oven where they are dried. This process is applicable for products ranging in size from purse clasps to automobile fenders. It is one of the most economical of all finishing methods, in terms of labor and materials, but should only be used in mass production as it involves a large investment in equipment and in the large volume of finishing material which must be used in the tank.

Gasket coating is a process often used for finishing such products as pencils, broom handles, wire, and the like. In this process, the products, after being dipped in the finishing material, are pressed through close fitting rubber, felt, or steel gaskets, which wipe off the excess of the finish and assure a very uniform coating. Where the output is large, the whole process can be completely mechanized.

In tumbling, products are finished by rolling them in a revolving barrel with a small quantity of finishing material, which is either poured into the barrel or sprayed on the products. The process requires from

FINISHING PROCESSES AND THEIR APPLICATIONS

Process	*Character of Product*	*Volume of Production*	*Color Variety*
Spraying, Manual	Unlimited	Small to large	Unlimited
Spraying, Automatic	Limited	Large	Limited
Dipping, Manual	Limited	Small	Unlimited
Dipping, Mechanical	Large variety	Medium to large	Limited
Gasket Coating	Slender and of uniform cross-section	Large	Limited
Tumbling	Small, light	Medium	None
Centrifuging	Almost all small products	Large	None
Roller Coating	Sheets, plates	Unlimited	Limited
Brushing	Unlimited	Small	Unlimited

Limitations of the various paint finishing processes are indicated in this table. The spray gun is the most widely used method for lacquering and enameling, since it gives uniform results when properly used

15 to 30 min. With metal parts, the application of this process is restricted to small, light objects that are so shaped that they will roll over each other when the barrel is revolved. Solid metal balls, cubes, and other heavy articles cannot be tumbled, because, on account of their weight and hardness, they will be polished excessively by the process. On the other hand, hollow metal spheres, hollow cylinders and the like can be tumbled successfully.

Centrifugal finishing also is used for small products and is much more rapid than tumbling. The process is carried out in special machines, one of which operates as follows: The products to be finished are placed in a basket in the upper part of the machine and the cover is clamped down. The basket then automatically is lowered into a tank of finishing material located in the lower part of the machine, then raised and finally rotated at high speed, first in one direction and then in the other. This rapid spinning and quick reversing removes the excess of finishing material and insures an even coat. After centrifuging, which takes less than a minute, the basket is removed and the products are dried in an oven or otherwise.

Centrifuging is applicable to almost all small metal products, except those that are perfectly flat and those so shaped that they tend to nest together. Large, symmetrical disk shaped products, such as some types of automobile wheels properly racked, can also be finished in a similar way. Centrifugal machines are relatively high in cost and not economical unless the output is large enough to keep them in fairly steady use.

For coating thin plates, sheets, slats, or wood of uniform size and thickness, roller coating machines are widely used. These machines apply the finishing material to the work by means of rolls, and can be adapted to any volume of production by suitable mechanization. Roller-coating is finding increasing use because of the speed and economy of operation. It is undoubtedly the cheapest of all finishing methods. The coating of thin sheets for the sign and can industries is done principally by this inexpensive method.

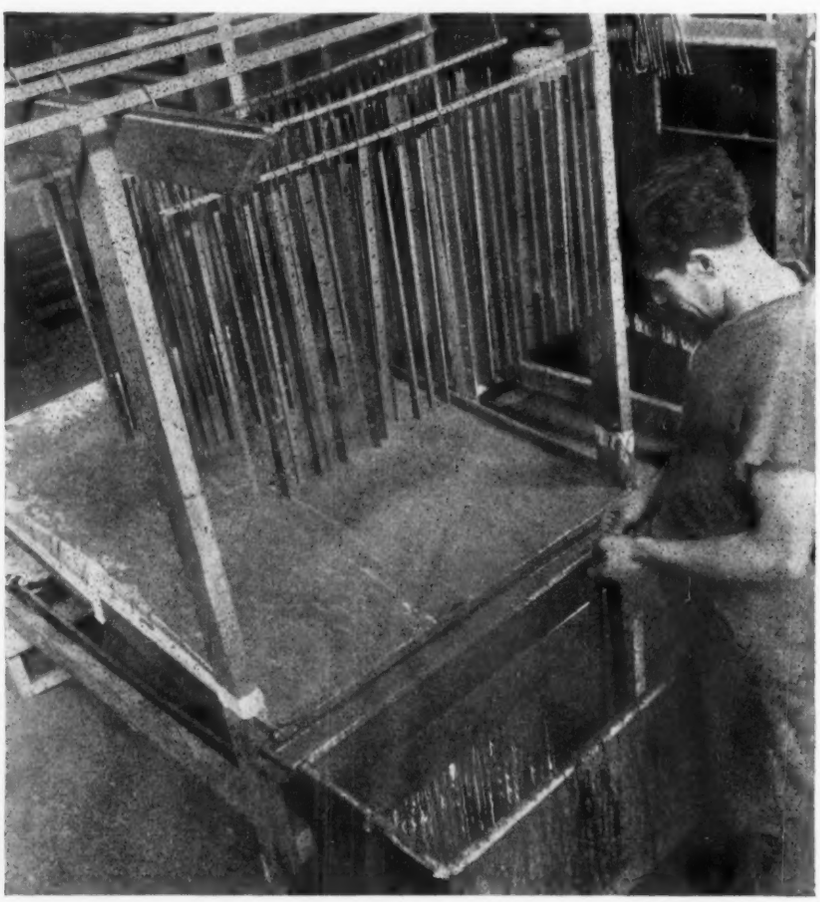
The first or base coat is applied with a roller-coating machine and this is followed by the application of printing or art work by lithographic or silk screen methods, depending on production volume. If a high gloss is desired a topcoat is applied, again using the roller-coater. Varnish and synthetic base products are used principally for this work. Lacquer, due to the penetration and pick up between coats, has found only limited use. Generally the quality and appearance is not as good as work finished by spray methods. An interesting special use of roller-coating is the application of the second color to the raised lettering of automobile license plates.

Where production is too small to warrant any investment in finishing machinery, finishes can be applied by means of brushes. Brushing with lacquer requires great skill, however, and satisfactory results only can be obtained by experts. Painters, no matter how experienced, are unable to do good lacquering without special training.

It must not be forgotten that the finishing materials applied form an essential part of any finishing process and must be selected carefully for each particular application. Each finishing process requires finishing materials with special characteristics, and in no case will a lacquer or enamel that is suitable for one process and product necessarily give good results with any other combination.

In addition, the finishing materials must be adapted to the tempo of the production process, drying at a rate of speed that will keep the flow of products through the plant continuous. "High speed" finishes are of special importance in many cases, but as these materials were discussed in a recent article (*AM*—Vol. 82, page 232) no further reference to the subject need be made here.

Not many years ago industrial finishing was an art over which production management had little control. It took just so long to do each job and the only way to speed matters up was to enlarge existing facilities or to accept poorer quality. Today, the variety of finishing processes and finishing materials is so great that the finishing of any product with any kind of material can be geared directly into the production process. In fact, if the finishing room becomes a bottle-neck, or if the finishing cost per unit becomes unduly high, it is a sign that there is something wrong with the finishing schedule.



Manual dipping often is used for finishing in a single color a limited number of products that are easy to handle. In the set-up shown, finished stampings are dipped first in a coat of gray primer, then in a coat of gloss black enamel. Advantages of this process, where it can be used, are its simplicity and low first cost

PRESS WORKING OF METALS • NUMBER 8

Die Designations

For maximum effectiveness, the designer should have a working knowledge of nomenclature, layout methods, quality grades of dies and their cost of production

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IN ENGINEERING offices where large dies are designed, it is customary to refer to the die holder and its attached parts as the "lower die," and to the punch holder with attachments as the "upper die." The word "die" has a double meaning; it may refer to the entire press tool or only to the individual die block or sections that carry the shape or outlines of the work. *Die block* is probably a better name for the individual block, and *die sections* for the blocks in a sectional die. Using these terms avoids confusion of names and favors clearness of expression. The terms "die block" and "die sections," as defined, are so employed throughout this series. A complete tool is used in a punch press will be called a "press tool," but at times it will also be called a die.

For Automobile Bodies

Specifications often used in viewing dies for drawing and forming automotive body parts are: "Drawn on car-line" and "Drawn off car-line." When it is possible to finish a piece in the die on a plane parallel with its final assembly in the car, the tool is said to be "Drawn on car-line." On the other hand, for drawing a die "Off car-line," the number of degrees of arc are specified which indicates the angle to which the work must be tilted from its normal position in the assembled car to clear the forming and drawing punches when these members enter the die.

An example of a die drawn off car-line would be a forming and drawing die for producing a highly streamlined fender having a drawn-over front that would obviously interfere with the forming and drawing members of the tool, unless the opposite end of the fender is elevated a number of degrees away from its normal car-line position.

In first class die drawings, piece parts are not detailed on assembly drawing sheets; details belong on secondary sheets. The dimensions given on the assembly drawing are general. Give the available tool area of the die set represented by its length and breadth. Give the diameter of the punch shank, but if a punch shank is not used, give the size and location of the bolt holes through the die shoe and punch holder for securing the die in the press.

Most dies are drawn in closed positions, which is at the down stroke of the press with the work finished. The closed height should be given, and usually the thickness of the die shoe and punch holder and the length of guide posts. The closed height of a press tool is the distance from the top surface of the punch holder to the under surface of the die shoe when the tool is shut. The closed height must not exceed the maximum die space of the press. The maximum die space is measured from the face of the ram to the surface of a standard bolster plate, when the press stroke is down, and the screw adjustment above the ram is fully screwed up.

If the closed tool height is greater than the maximum die space of the press, this error may be corrected by reducing the thickness of the upper or lower members of the die set, or by using a bolster plate of less than standard thickness. To reduce the closed tool height by using any other subterfuge may sacrifice the utility or working life of the tool. If none of these changes can be made, it will be necessary to use the tool in a larger press having a greater die space. Such a press has fewer strokes per minute and the hourly output would therefore be proportionally reduced.

Detail numbers are assigned to each separate die part and should correspond with the numbers given later in the material list on the assembly sheet. Finished parts are dimensioned $\frac{1}{8}$ in. under the commercial sizes of rough steel which allows sufficient material for machine finishes. Where a part of a hole is cut into one edge of a block, the stock ordered should include the full diameter of the hole. The part of the hole not wanted is machined from the block after boring the hole.

Initiating the Drawing

If the design is not "a repeater," meaning one often made before, and if the tool must perform one or more unusual operations, it is advisable to begin the design with preliminary try-out sketches. Lay out the blank or the proposed series of operations in red. If the work is comparatively simple, make free hand sketches; if the work is rather complicated, draw it to scale. If the part to be made is very small draw it five or ten times full size. Large work can be scaled down to half size, but in all cases the individual tool parts are detailed full size. To enlarge a drawing five sizes quickly, lay it out ten times full size, using a half size scale. Develop the design from the center of the piece toward the outside.

Draw the tool steel members first

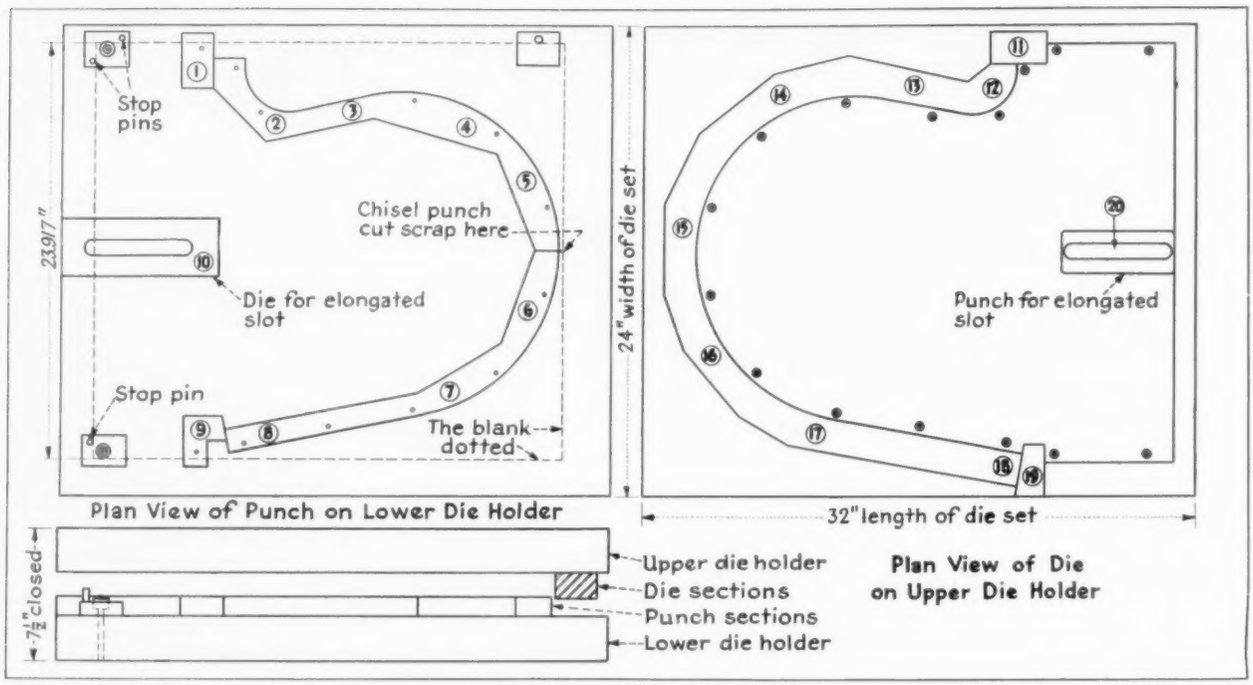


Fig. 41—Die drawings should preferably show the plan of the die block in the upper left-hand corner, and the elevation of the complete tool below. The plan of the upper member can be placed at the right of the lower-die plan

and then add a sketch of the die set. Transparent templets of standard die sets are used by laying them over the drawing. When the proper size of templet is found and positioned, scribe a line around its edges.

The assembly drawing for ordinary press tools should present at least two principal views, the lower die plan and the front elevation. In unusual designs three or more views are sometimes necessary. The lower die plan is the upper left hand view. In this view, the surface of the blocks on the shoe are shown and the upper die is omitted for clarity. If a plan view of the upper die is necessary, it is customary to show it at either side ot the lower die plan. Show the upper die holder as having been lifted from the lower die and turned face up (revolved 180 deg.) from the direction in which it was lifted.

The front elevation is drawn below the lower die plan; this is a view of the tool as seen on the press in front of the operator. The importance of making the front elevation represent the operator's view cannot be over stressed; in many dies the working principle and parts are difficult to explain or to understand if this usual standard is neglected. Two views of a die as just described follow.

Fig. 41 illustrates a die used in a tractor plant for blanking part of a container. This drawing is a good example of a compound sectional die. There are nine sections in both the upper and lower die members. Fifteen small holes and one enlongated slot are cut simultaneously with the blank. A rectangularly sheared cold rolled steel blank 1/16 x 24 x 27 in. is the work material. The blank is positioned over the lower die, or punch, against the four stop pins shown. This tool is considered a large one in shops doing light manufacturing. The spring stripper plate shown within the die is torch cut to shape and the edge is subsequently rough ground for a loose fit inside the die opening.

If the working relationship between punches, die blocks, pilots, shedders, spring pads, ejectors, guides, feeds, stops and gages, become clearer by showing additional right or left-hand projections of the plan, these should be made. The views should not be crowded or approach the border of the sheet less than one inch. These precautions indicate that foresight is necessary in planning the drawing unless the design is a very simple one. Preparatory sketches should be roughly plotted to scale from preliminary freehand sketches; this procedure determines the size of the views and thus enables one to plan his assembly and to choose the proper size of drawing sheet.

In rendering die drawings, sectional views are more frequently employed than in drawings for other types of tools and machines. The front view is usually a section taken on a vertical plane through the horizontal centerline of the die plan. Sectional views show the important interior construction upon which the final success of tool so much depends; this information is invaluable in the die shop where the responsibility rests for producing satisfactory tools.

Perforating and blanking dies are shown closed, especially when followed by forming or drawing operations in the same die. The relative lengths of the punches are thus accurately found which is an important determination.

In viewing a combination blanking and drawing die, the front elevation is always shown closed. The usual practice is to show a vertical section passing through a plane coincident with the horizontal centerline of the completed tool. Relative sizes of the cutting and drawing members are thus easily determined.

Press tools are not viewed in a closed position if legibility of the die parts is sacrificed. This condition is sometimes encountered in viewing the front elevation of certain forming and drawing dies where a deep closed position of the punch might obscure important features in

the die. In such cases it is best to divide the punch on its vertical centerline and show half of the punch *down* at the completion of the press stroke, while the remaining half is shown in ascent above the die entrance. Fig. 42 is an example.

The words "tolerance" and "allowance" in reference to varying dimensions are terms erroneously used interchangeably; these words have entirely different meanings. The American Standards Association defines tolerance as the amount of variation in the size of a part, and allowance as the minimum clearance space between mating parts. When the mating parts are equal in size, the clearance space is zero allowance. The allowance is negative in all cases from the closest fit possible to assemble by hand, up to and including heavy forced and shrink fits.

There are eight classes of fits and allowances, namely: (1) loose fit, large allowance; (2) free fit, liberal allowance; (3) medium fit, medium allowance; (4) snug fit, zero allowance; (5) wringing fit, zero to negative allowance; (6) tight fit, slight negative allowance; (7) medium force fit, negative allowance; (8) heavy force and shrink fit, considerable negative allowance.

In practice, minimum and maximum tolerances are specified for each of two mating parts that will provide the desired allowances between them. Fig. 43 presents a problem in tolerances and allowances for a medium fit. The plug must fit the hole with a minimum allowance of 0.002 in., the maximum allowance being 0.004 in. The diagram shows at a glance all the variable allowances that may occur in this case. There are other dimensions that fulfill these conditions, such as 0.252 in. max. and 0.251 in. min. for the plug and 0.255 in. max. and 0.254 in. min. for the hole. The dimensions usually start from the commercial size of the plug material.

Press Tool Standards

A loose-leaf book of tool standards is a time-saver for the tool engineer. The standards usually comprise all types of die sets which are not commercial, the space and dimensions for attaching feeding devices, chutes, magazines, air cushions, spring-pressure pads, and all other standard devices used in that particular shop. The standards should include the method for dimensioning dies, and the dimensions for presses in regard to the length, breadth and thickness of bolster

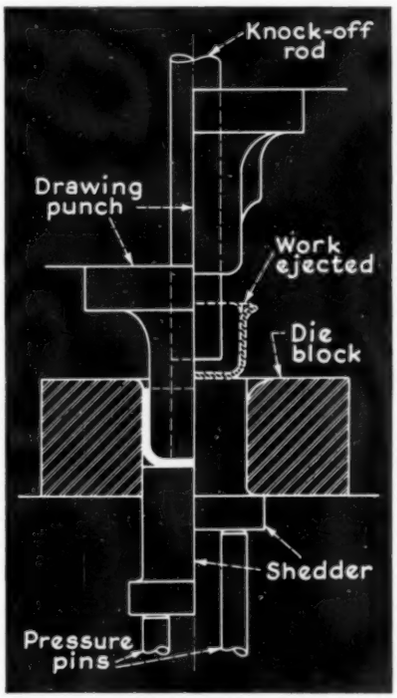


Fig. 42—Press tools are ordinarily viewed in the closed position, but exceptions must be made for clarity. If closed position of the punch obscures important features of the die, the punch is divided, one-half being shown up and the other half down

plates, size of openings through bolsters, the size of punch shanks, minimum die spaces, and the screw adjustment distance for the ram.

The general rule for tool dimensions that effect the product is a tolerance of plus or minus 0.005 in. on common fractional dimensions, and plus or minus 0.001 in. on decimal dimensions, unless otherwise specified. Close tolerances are difficult to reach and to maintain and should not be used unless absolutely necessary.

Tolerances should be as large as the accuracy of the work permits. Close tolerances should be questioned, if by using them tool costs are increased and output is restricted. Too many designers fall into the habit of specifying close limits just to play safe. Tolerances of omission instead of those of commission, may cost more later in the assembly departments. This fact points the way toward making a thorough investigation of the probable assembling difficulties of the product before deciding to use or to omit tolerances.

Classification of Press Tools

Dies are divided according to quality into about three general classifications. Some manufacturers classify the grades of dies into more than three divisions. The number of classes depends largely on the diversification of work to be performed.

Class A Dies

These embody the highest grade of workmanship and materials and must give maximum service for large and continuous production. This grade includes hardened, ground and lapped guide posts and bushings, automatic stop, and finger stops when necessary. The die block must not be less than 1 in. thick, and the cutting members must be within limits of $\pm$ 0.001 in. where required.

The die must have a $\frac{1}{4}$ deg. taper for its entire thickness or be straight for about $\frac{1}{4}$ in. from the top; die to have hardened steel bushings for all small perforating holes where possible. Stripper plate to be machine steel, fitted closely to punch, and to have hardened steel bushings for all small perforating punches where possible.

The blanking punch must be solid with a flange, and the perforating punches set in a punch plate. Blanking and perforating punches are to be provided with spring push-off pins where possible. Perforating punch heads must have hardened steel backup disks. Perforating punches that are less than $\frac{1}{4}$ in. diameter shall be placed in hardened quills when possible. Dowel pins and holes are to be ground and lapped. Clearance between punches and dies, and the alignment of all cutting edges, shall be such as to produce smooth blanks free from burrs.

Class B Dies

Such dies have high-grade workmanship and materials suitable for producing work of average or medium quality and must give long service for large production. This grade includes hardened and ground guide posts and bushings, automatic stop, and finger stops when necessary. The die block must not be less than $\frac{7}{8}$ in. thick, and the cutting members must be within limits of $\pm$ 0.002 in. where required. The die must have $\frac{1}{2}$ deg. taper for its entire thickness. The remaining specifications are the same as those for Class A dies.

Class C Dies

These dies have the following specifications: Plain punch and die holders; plain flat or pin stop; die block not to be less than $\frac{11}{16}$ in. thick, and the cutting members must be within limits of $\pm$ 0.003 in, where required. The die should have $\frac{3}{4}$ deg.

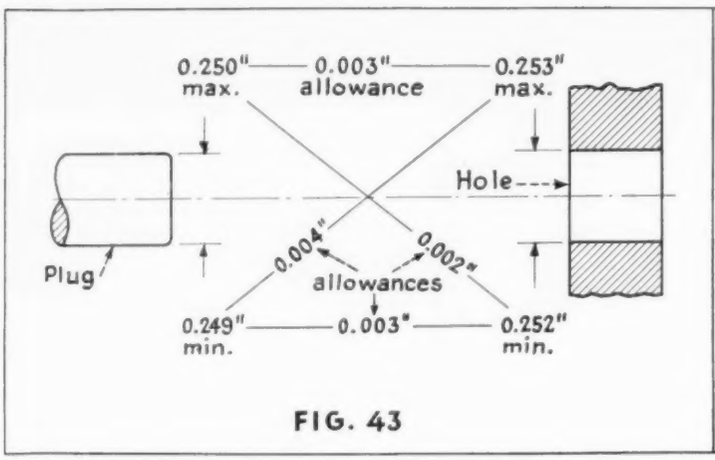


FIG. 43

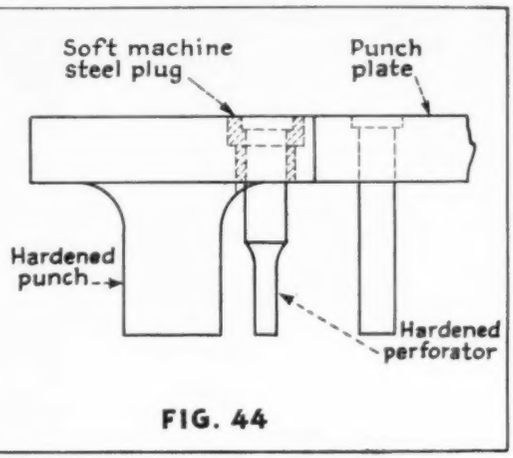


FIG. 44

Fig. 43—All conditions of allowance between a minimum of 0.002 in. and a maximum of 0.004 in. are shown for the dimensions given for the plug and hole. Fig. 44—A perforator close to a large punch can be secured with a soft machine steel plug in the punch flange, and it can be located accurately even though the hole in the flange is distorted

taper for its entire thickness. Stripper plate to be machine steel and not in contact with the punch or perforators. The punch is to be set in a steel plate or screwed to the punch holder; perforator bushings to be set in the die block when possible. Clearance between the punch and die to be such as to produce fairly smooth blanks, but small burrs are permissible. The general appearance of the die is not important and refinements are not necessary.

The above specifications apply to all classes of dies include blanking, blanking and perforating, progressive, combination and compound dies.

Temporary Dies

These dies should embody first class workmanship and materials, but because of small production requirements should have the following features: Plain punch and die holders; plain flat or pin stop; die to be $\frac{1}{2}$ in. or less in thickness, according to requirements; cutting members to be within $\pm$ 0.005 in., or more if specified. Die block to have $\frac{3}{4}$ to 1 deg. taper; stripper plate to be thin machine steel plate with strips underneath to form a guide for the stock; the plate should not contact the punch or perforators. The punch and perforators to be short and set in machine steel plate on the punch holders or held with set screws or other inexpensive means. Blanks produced in this die should be fairly smooth, but small burrs are permissible. The general appearance of the die is unimportant, and refinements are not necessary; machine finishing the parts is required only where necessary to make a fit.

In high-grade dies, perforators near a larger punch are secured by soft steel plugs in the punch flange as shown in Fig. 44. Sometimes this condition is unavoidable and the flange is then made to serve as the punch plate. The advantage of using this method is that the perforator can be accurately located even though the counterbored hole in the flange has become distorted or has changed in position after hardening. A similar method is used for locating guide posts and guide post bushings in die shoes and punch holders that are hardened tool steel. The soft steel plugs are press fitted in suitable holes in the hardened upper and lower die set members before boring the guide post and bushing holes.

In manufacturing concerns where the product is composed largely of sheet-metal parts, the die expense and maintenance is several times the cost of tools for drilling and milling, in fact all other tools combined. This expense is offset, however, by the ease and speed in which well-designed dies will continuously produce duplicate parts in great quantities. The approximate cost and upkeep of dies, and the cost of the output are important factors to be aware of when beginning a new die design. An indication of good tool engineering is to know when and when not to incur the expense of making tool drawings; the specification of necessary tolerances, and the grade of tool required to produce the work.

The approximate cost of the material in the average press tool, roughly expressed in dollars, is to multiply the width, length and closed height together and divide by 20; this is for raw material costs only and includes no labor, and is for a quick offhand estimate. For accurate material costs, the cubic inch contents of each member of the tool in the rough, are computed and multiplied by the weight of the material in pounds per cubic inch, times the price per pound. If the die set is a commercial one, the price, less discounts, is taken from manufacturers' catalogs. Tables of weights for standard sections of steel are available for making these estimates.

Die making costs often depend upon the skill of the diemaker and the efficiency of the machine tools he uses. Some manufacturers prorate the overhead expense on the basis of the previous years' operations. The overhead expense varies in different localities, but it should be definitely known and included in estimates.

Cost of Die Production

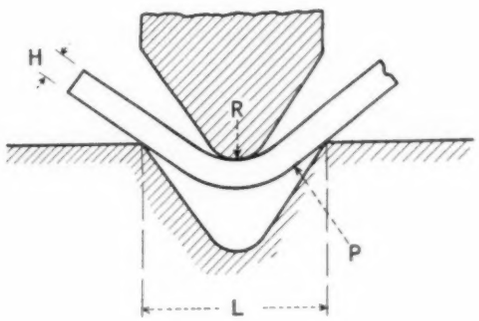
The material necessary for blanking 1,000 pieces is computed by multiplying the area, in square inches, of the material used for one blank, by 7.3 times the weight of the raw material per square foot. This formula allows 5 per cent for waste ends.

When a press is fed by hand only 40 per cent of the total number of press strokes are utilized. If an automatic roll-feed attachment is used, more than 80 per cent of the strokes are used. The following formulas are useful for computing the labor and material costs per 1,000 blanks. For hand feed: $T = S \div 0.024\ N + M$. For roll feed: $T = S \div 0.048N + M$. In the above formulas: T = total cost of labor and material per 1,000 blanks. S = operator's hourly wage. N = number of press strokes per minute, and M = material cost per 1,000 blanks.

AMERICAN MACHINIST *Reference Book Sheet*

Pressures for Right-Angle Bends in Steel

F. GEORGE CALI
Tool and Die Designer, Snead & Company



ACTUAL tests were made to secure the tabulated pressures for making right-angle bends in steel of 60,000 lb. tensile strength. These pressures are given for die openings of 8, 12 and 16 times the metal thickness. When the die opening L equals 8 times the metal thickness, the inside radius R in the bend is small and the sides are straight. When width L is increased, the inside radius is slightly curved.

To obtain the total pressure required to make a bend, multiply the pressure per inch of bend, as given in the table, by the length of the bend.

The following formula was developed from the test data:

$$W = \frac{CSBH^2}{L}$$

Where:
W = Total force to bend, in lb.
S = Tensile strength, lb. per sq. in.
B = Length along the bend, in.
H = Thickness of metal, in.
L = Width of female die, in.
C = Constant depending on die opening
For 8 times metal thickness, $C = 1.33$
For 12 times metal thickness, $C = 1.24$
For 16 times metal thickness, $C = 1.20$

Example:

For a right-angle bend in $\frac{3}{8}$ in. steel of 60,000 lb. tensile strength, a bend 6 ft. long and a die opening of 3 in.

$$W = \frac{1.33 \times 60{,}000 \times 72 \times (\frac{3}{8})^2}{3}$$

$$W = 270{,}000 \text{ lb.}$$

From table, it is found that the pressure per in. of bend is 3,750 lb. Total pressure for the bend equals 72 x 3,750, or 270,000 lb.

METAL THICKNESS H U.S.S. GAGE	WIDTH OF FEMALE DIE, IN.	APPROX. INSIDE RAD., R	PRESSURE IN LB. PER IN. OF LENGTH ALONG BEND
16	½	0.062	625
	¾	0.110	390
	1	0.155	280
14	⅝	0.078	780
	15/16	0.137	485
	1 ¼	0.195	350
12	⅞	0.109	1,090
	1 5/16	0.190	680
	1 ¾	0.275	490
11	1	0.125	1,250
	1 ½	0.220	775
	2	0.310	562
10	1 ⅛	0.140	1,400
	1 1/16	0.245	870
	2 ¼	0.350	630
3/16	1 ½	3/16	1,875
	2 ¼	5/16	1,165
	3	½	845
¼	2	¼	2,500
	3	7/16	1,550
	4	⅝	1,130
5/16	2 ½	5/16	3,125
	3 ¾	9/16	1,935
	5	¾	1,410
⅜	3	⅜	3,750
	4 ½	⅝	2,320
	6	15/16	1,690
7/16	3 ½	7/16	4,375
	5 ¼	¾	2,710
	7	1 ⅛	1,970
½	4	½	5,000
	6	⅞	3,125
	8	1 ¼	2,250
9/16	4 ½	9/16	5,625
	6 ¾	1	3,490
	9	1 7/16	2,540
⅝	5	⅝	6,250
	7 ½	1 1/16	3,880
	10	1 9/16	2,820

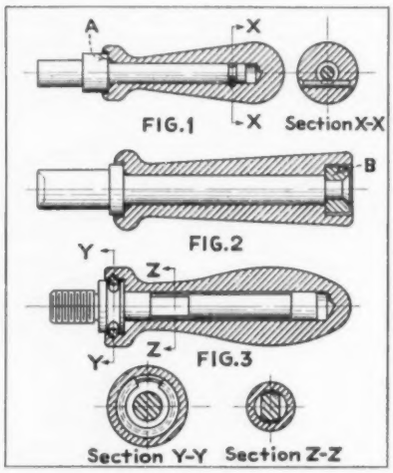
IDEAS FROM PRACTICAL MEN

Free-Turning Handles

FRED ADAMS

Referring to the article by F. H. Martin under the above title (*AM*—Vol. 82, page 651) there are other designs of free-turning handles of which I would like to add a few worthwhile examples. The handles illustrated in Figs. 1 and 2 are of German origin. Both of these types are now standard in that country and can be had in various sizes.

In the handle in Fig. 1 the spindle has a half-round groove near the outer end to accommodate a small pin, the center line of which is tangent to the outside diameter of the spindle. After the pin is driven through the handle it is riveted and the ends are gound or filed flush with the handle, as shown in the end view. The groove for the pin is sufficiently large for clearance which must be greater than that at *A* because the handle must rest solidly against the shoulder when the spindle is pressed into the rim of the handwheel or the end of the lever in which it is used.



Three free-turning handles, two of which are of German origin and are standardized in that country, are retained on their spindles by various devices

In the handle in Fig. 2 the outer end of the spindle is turned down for the retaining collar *B* which is attached by riveting the end of the spindle over it at assembly, and which is nested in the counterbore at the outer end of the handle. The inner end of the spindle is countersunk for riveting to the rim of the handwheel. Whereas the bottom of the hole drilled for the spindle in the handle in Fig. 1 is filled with grease for permanent lubrication, it is suggested that either a chamber in the bore or a recess in the spindle of the handle in Fig. 2 be machined to serve as a pocket for grease. It will be seen that the riveted portions of handles in Figs. 1 and 2 must be drilled out should it become necessary to disassemble them.

The handle in Fig. 3 is retained on its spindle by a wire snap-ring. Before assembling the handle on the spindle, the spindle is screwed into the rim of the handwheel on which it is to be used. A flat on the spindle, as shown in section Z-Z, is for a wrench in screwing the spindle into the rim of the handwheel. The snap-ring is inserted in the deep groove in the large diameter of the spindle and, as the handle is being pressed on the spindle, its bell-mouthed end compresses the snap-ring into the groove in the spindle. When the grooves in the spindle and the handle are in line, the snap-ring expands to engage the half-round groove in the handle, thereby retaining the handle on the spindle. Grease is used as a lubricant.

Reciprocator Aids When Lapping Large Joints

FRANK C. HUDSON

Lapping-in joints having large surfaces frequently requires considerable effort when the part has to be moved by hand. Some railway shops have harnessed the versatile air-driven drill motor for this work. A device for grinding exhaust pipe joints developed by the Chesapeake & Ohio Railway Company is shown in Fig. 1. In this arrangement, a specially developed "old man" supports the air drill motor, which is connected to a crankshaft and, in turn, to a clamp on the casting to be moved. An outline of this arrangement is shown in Fig. 2.

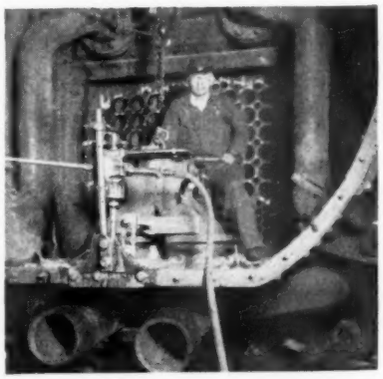


Fig. 1—A special eccentric driven by an air-drill motor actuates the casting when lapping-in exhaust pipe joints in the railroad repair shop

Behind the base plate of the upright are two brass-bushed bearings which carry the eccentric, or crankshaft, which imparts the desired motion to the rod connected to the clamp. These bearings have bolt extensions that serve to fasten the triangular base plate and upright together, as well as to hold the bearings in position. The eccentric shaft has a taper shank which fits in the socket in the spindle of the drill.

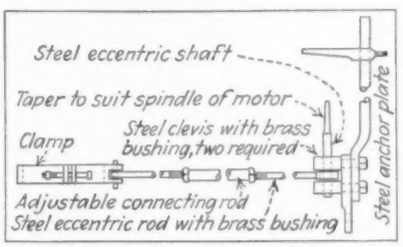
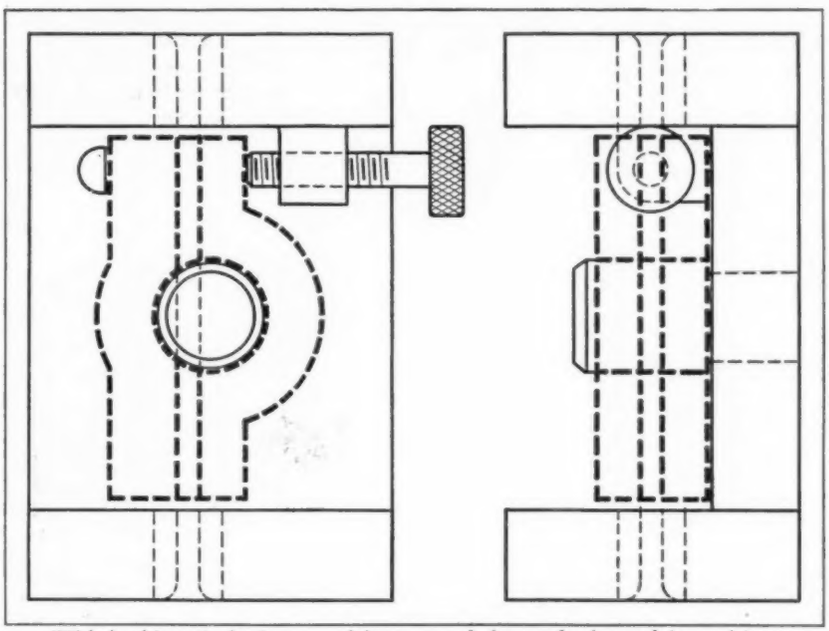

Steel eccentric shaft
Taper to suit spindle of motor
Clamp
Steel clevis with brass bushing, two required
Steel anchor plate
Adjustable connecting rod
Steel eccentric rod with brass bushing

Fig. 2—Clamp on the end of the connecting rod of this arrangement can be changed to suit requirements

Foolproof Attachment To a Drill Jig

MATTHEW HARRIS

The device described by Paul C. Bruhl in an article under the above title (*AM*—Vol. 82, page 382) does not render the jig quite as foolproof as the title of the article would indi-



With bushings in both top and bottom and the work clamped in position, the jig is turned upside down for drilling the second hole

cate. Naturally, there must be two holes in the gage, one of which is in line with the hole in one of the bushings, while the other covers a blind spot in the work, so that the operator must squint into both holes to find in which one to put his drill.

While the gauge is ingenious, it can be eliminated by improving the design of the jig. If it had been provided with bushings in both the top and bottom, as shown in the accompanying illustration, it would simply have to be turned over for drilling the second hole. As an alternative, a hole could be drilled through the locating stud to serve as a guide for the drill, so that by using a long drill the hole could be drilled entirely through the work. In either case there would be no necessity for taking the work off the locating stud, rotating it 180 deg. in the vertical plane and putting it back for drilling the second hole, thus slowing production.

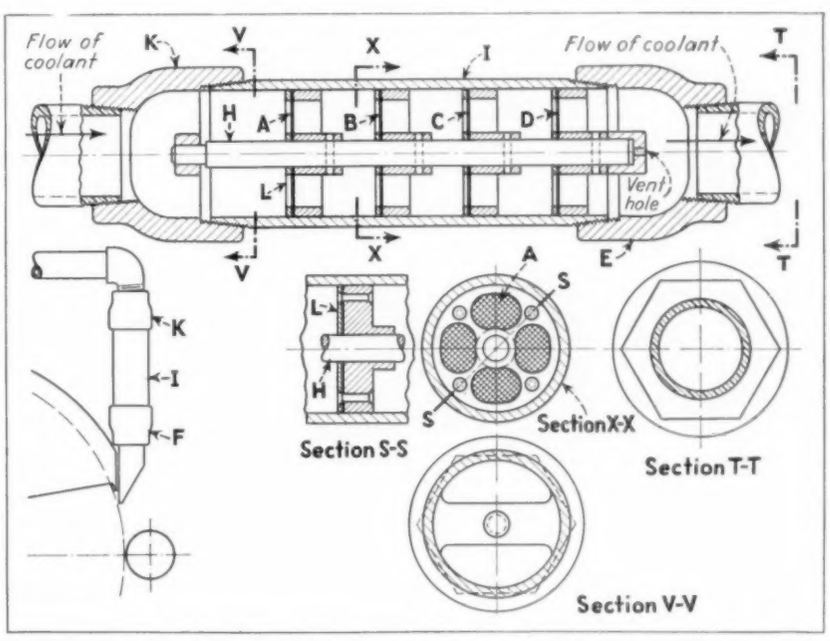
Coolant Strainer for Cylindrical Grinders

J. R. WHITTLES

In the illustration is shown a coolant strainer for the cylindrical grinder. It takes the coolant from the settling tank and separates the chips and grit as it is pumped to the work and the wheel. The coolant is strained through the four separate screens at *A*, *B*, *C*, and *D*, each successive screen being of finer mesh than the preceding one, so that no one screen does all the work. By this method the different sizes of chips and grit are separated until the compartments are filled, then by unscrewing the lower cap *F* the assembled straining unit can be removed, cleaned and returned to place.

The screens and their holders are assembled to the rod *H* and the holders are ground on the outsides to fit the pipe *I*, which is internally ground, so that the assembled straining units can be slid in or out. The end cap *K* has a bearing for the upper end of rod *H* and is similar to the cap *F*, except that the lower end of rod *H* rests in a blind hole from which there is a vent to let out any coolant that may collect there.

The circular plates *L* have four elliptical holes and hold the screens to the holders with rivets. The coolant flows in the direction of the arrow. At the lower left is a small-scale drawing showing the complete strainer attached to the coolant system of a cylindrical grinder.



The coolant passes through four screens on its way from the settling tank to the work, each succeeding screen having a finer mesh

Change Gears for Metric Pitches

FRANCIS W. SHAW
Mount Ebor, Lancashire, England

Cutting, milling or grinding screws of metric pitch on machines having an "inch" leadscrew is a problem best solved, where space permits, by including a 127-tooth gear in the change-gear train. Where the leadscrew has 2 threads per inch, a 100-tooth gear on the work spindle meshing directly, or through idler gears, with a 127-tooth gear on the leadscrew produces a work pitch of 25.4 mm. to the inch, which coincides with the international equivalent.

One alternative to the 100/127 ratio is 26/33, but this makes the inch equal to 25.3846 mm.; another alternative, 37/47, makes the inch 25.4054 mm.; while still another, 63/80, gives 25.3968 mm. per inch. All these are useful in some circumstances; however, these inaccuracies are not permissible for fine work.

The ratio $(41 \times 7 \times 2) \div 3^6$ is, as far

as we know, not in general use. Its accuracy exceeds that of most usual ratios; the inch value being 25.4007 mm. The error, 7 parts in 10,000, is negligible in practice. This seemingly complicated ratio can be resolved into the simple compound ratio of (41x28) ÷ (54x28), whose value is 20/25.4007. The compound train represented by the bracketed figures is correct for a 10 mm. work pitch and a leadscrew pitch of 2 threads to the inch.

The following expression can be made the basis of formulas suitable for calculating the gear train for machine having a leadscrew of 2 threads per inch:

$$\frac{41\text{x}28\text{x}AM}{54\text{x}27\text{x}10A}$$

In this expression, M is the work pitch in mm. and A is a factor necessary to convert M into a suitable number of teeth. Where the smallest gear has 20 teeth, AM cannot be less than 20; where the largest has 80 teeth, $10A$ cannot exceed 80. The following formulas have been found suitable for the specified work pitches and demand a minimum of calculation:

For pitches between 2.5 and 10 mm.:

$$\frac{\text{Drivers}}{\text{Followers}} = \frac{41\text{x}28\text{x}8M}{54\text{x}27\text{x}80}$$

For pitches between 5 and 20 mm.:

$$\frac{\text{Drivers}}{\text{Followers}} = \frac{41\text{x}28\text{x}4M}{54\text{x}27\text{x}40}$$

Four of the gears in each of the above trains are invariable; permitting the mounting of these gears on fixed centers. The 80- and 40-tooth gears are changed only at a change from one pitch range to another. Where pitches vary widely, as they will in many gear shops, each tooth number should be available. Change gears are relatively inexpensive and a shortage never should be allowed to impede production.

To determine a gear train for 19.25 mm. pitch, where the leadscrew has 2 threads per inch, substitute ($4M = 4\text{x}19.25 = 77$) in the second formula:

$$\frac{41\text{x}28\text{x}77}{54\text{x}27\text{x}40}$$

Where a gear train for a 5.75 mm. pitch is required and the leadscrew has 2 threads per inch, substitute ($8M = 8\text{x}5.75 = 46$) in the first formula:

$$\frac{41\text{x}28\text{x}46}{54\text{x}27\text{x}80}$$

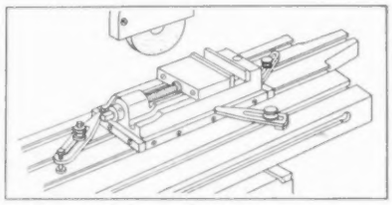
Non-standard pitches may, of course, necessitate special calculations; though there always is a chance of the prime numbers cancelling out. Where the leadscrew has 4 threads per inch, the same formulas can be applied, but the 28-tooth gear would be replaced by a 56 gear. On the other hand, if the lead screw has one thread per inch or the lead screw constant is 1, the 27 gear would be replaced by a 54 gear. This will require an extra 54-tooth gear.

Clamping-Straps Extend Usefulness of Vise

CHARLES H. WILLEY

Superintendent of Manufacturing, Hoyt Electrical Instrument Works

Desiring to extend the usefulness of a light-weight drill-press vise, one of the mechanics in the shop attached four ½-in. square steel strips to the bottom edges by screws, making a flange around the base of the vise. In the illustration, this light-weight, low-height vise is shown mounted on the table of a surface grinder, where it is secured by strap clamps bearing on the steel strips. These clamps can be placed wherever required.



Steel strips attached to the bottom edges of a drill-press vise make possible the clamping of the vise to machine tables with strap clamps

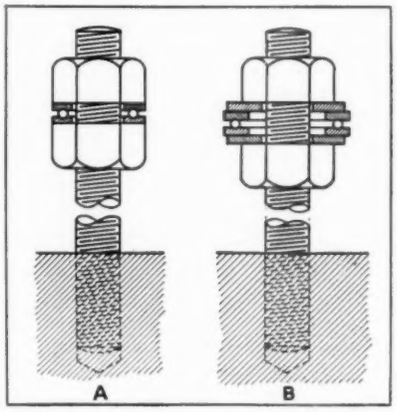
The low-height of this vise made possible a simple set up for surface-grinding a number of small parts that, otherwise, would have been difficult to secure to the table of the grinder.

Old Thrust Bearings Help to Set Studs

EMIL WITTMANN

In setting and removing studs it is the usual practice to put two nuts on them and jam the nuts together, using two wrenches, one on each nut. The studs can then be set by turning the top nut, or removed by turning the bottom one.

If, however, a ball bearing of the thrust type is put between the nuts, as at A, they can be locked against it without the necessity of holding one nut with a wrench while the other one is turned with another wrench. Furthermore, after the stud has been set it is an easy matter to unlock either of the nuts and remove them and the ball bearing. In case the bore of the ball bearing is much larger than the diameter of the stud, heavy plate washers can be put between it and the nuts, as at B, to take the thrust of the nuts.

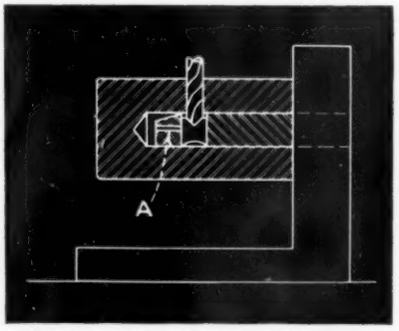


By using a thrust-type ball bearing between the two nuts, they can be locked on a stud by using a wrench on one nut

To Remove Burrs From Intersecting Holes

W. BAMFORD

Referring to the article by Herbert Chase under the above title (*AM*—Vol. 82, page 773), an obvious improvement would be to drill a small axial hole in the outer end of the locating stud, as at A in the illustration, to prevent air from being trapped in the blind hole in the work.



A small axial hole drilled in the end of the stud will prevent air from being trapped in the work

Instead of the drilled hole, a small groove or a flat milled lengthwise of the stud would answer the same purpose in most instances.

NEWS OF THE INDUSTRY

Huge Air Defense Program Raises Problem of Increased Production

Metal-working industry expected to benefit considerably from aircraft orders from both military and commercial sources

BLAINE STUBBLEFIELD
McGraw-Hill Washington Bureau

WASHINGTON—The metal-working industry must include large-scale airplane production in its plans for the future. This country has decided to police the Western hemisphere under the Monroe Doctrine. Most Washington observers believe also, like it or not, that the United States again will be forced to defend the world's democracies. Washington is planning a war machine bigger than any ever seen. One of its major elements will be air power.

Deliveries of commercial and military airplanes, engines and spare parts totaled $73,031,816 in the first six months of 1938, as compared with $49,450,114 in the first half of 1937. Exports of all aeronautic products from the United States in the first nine months of this year totaled $53,335,175, an increase of 93 per cent over the same period of 1937. This total includes none of the 500 planes recently ordered by England and France.*

Increases to Continue

Big increases will continue year after year unless some effective move is made by the nations to put down their armament loads. The U. S. War Department has abandoned its "Baker Board" figure of 2320 airplanes for the Air Corps by 1940 as horse-and-buggy stuff, and has set itself a new goal, variously estimated at 6,000 to 10,000 planes. Of course, obsolescence is working all the time and many more than the actual quota must be built. The Navy, which has clamped down tighter than ever on public information, is said to have laid plans for 1,000 more airplanes than it has now.

How many planes can the United States build as its facilities stand today? The best authority says around 3,000 a year, both military and civil. That is operating on a single 8-hour shift. Few if any of the factories, even the military plants with the big-order backlogs, are running more than one shift, except in an occasional department which has fallen behind. What could our plants do on a 24-hour basis at the very top of capacity? The answer is only a guess. But the same authority estimates that, by adding some machinery here and there and by adding floor space where needed, the 3,000-figure could be tripled.

Skilled Labor a Problem

What could the United States do if put right up against a coalition of air powers? You can amuse yourself by making your own answer. Men who think along these lines offer this suggestion: If the United States really got down to counting butter pats for economy and threw the full weight of its vast resources into armaments, as Germany and Italy are doing, we could darken the sky with wings.

Now and then somebody makes a study of aircraft on hand and productive capacity of major foreign powers. Four or five years ago it was done with reasonable accuracy. Today such presentations are pure trumpery. On the one hand, a nation that turns all its energy on such production can do a lot of it. On the other, the fighting-cock powers naturally are given to bragging. This writer has interviewed an air authority of 20 years experience who has just surveyed the aircraft situation around the world. He says that Germany may possibly have 10,000 ships, as reported, but his observations indicated that some substantial portion of them are "crates". But one thing is sure—Germany, Italy, Russia and probably Japan are each far ahead of this country or England. That is true also of "ready-to-go" manufacturing facilities.

One reason why U. S. plants such as Martin, Boeing and Lockheed, don't rush into two or three shifts and turn their opportunities to gold is that they can't get the skilled labor. While numerous operations can be handled by common labor, there are enough high-skilled jobs to prevent casual doubling or tripling of manpower. Undoubtedly though, with a big bonanza in the offing, enough men will go through the schools or serve apprenticeships to fill up the ranks at top capacity.

Still Another Problem

If the country had to produce faster than the present maximum, another problem, in addition to skilled labor, would arise. What non-aircraft plants could fill in while more aircraft factories were being built? Since nearly all goods are themselves munitions nowadays, that would be one for the war chiefs to decide. The Industrial Mobilization Board has its 10,000 dummy contracts with all types of concerns which would start their assigned functions at the drop of a telegram. Presumably the mobilization plan calls for manufacture of airplane parts, by various qualified concerns, for assembly by still others. But assembled airplane production has not been very successful, here or abroad. It's a question whether the government is banking much on it.

United States' "Monopoly"

American plants are practically the only source of aircraft in the entire Western hemisphere. Argentina has one that is reported as producing 40 or 50 planes a year, and which could turn out quite a flow if necessary. Its output is mostly French designs and it uses some American engines. There is an Italian plant in Peru which is controlled by the government, manufacturing for its own account. Mexico City has one shop manufacturing all American designs. Brazil is trying to promote itself a plant. Canada has several: two or three off-shoots of American and British concerns, now on their own; three or four still associated with parent companies here and in England, and one, Canadian Car and Foundry, which is said to be

* Figures from Aeronautical Chamber of Commerce and U. S. Department of Commerce.

strictly Dominion business, no connection with the company of similar name in this country. These Canadian concerns do standard work but have no appreciable capacity, as was made clear when the British airplane mission was here last Spring and left its order with Uncle Sam.

So for the present at least the United States has the New World market pretty much to itself. This will not always be so. When the angry nations overseas finally get around to producing their own airplanes, they will have a heavy labor cost differential advantage on us, as they have in most other production. We still have it over them in automobiles and some other manufactures because of our superior chain production.

If the Monroe Doctrine brings us to military action it remains to be seen whether the other American countries will sit up and buy or produce their own armaments, or lie down and let the Colossus of the North, self-appointed defender, carry the burden. Chances are they will want fire-works of their own as defense against their "good" neighbors. If so, they can buy from the lowest bidders, and that time may find Europe eligible. Then practically any country can have the distinction of being bombed from airplanes of its own manufacture.

U. S. Government Contracts Awarded to Metal-Working Firms

(Awarded from Oct. 17 to Oct. 29)

Contractor	Gov't. Agency	Commodity	Amount
National Tube Co., Pittsburgh, Pa.	War, Ordnance....	Shell forgings.....	$76,534
Detroit-Michigan Stove Co., Detroit, Mich.....	War, QMC.....	Gas ranges.....	27,200
Wickwire Spencer Steel Co., New York, N. Y.....	War, Engineers....	Wire fabric.....	21,127
Northwest Engineering Co., Chicago, Ill.....	Agriculture.....	Power Shovels....	32,314
Miehle Printing Press & Mfg. Co., Chicago, Ill.....	Govt. Printing Off.	Printing presses...	110,140
Northern Pump Co., Minneapolis, Minn.....	Navy, S&A.....	Pumps.....	126,717
Worthington Pump & Machinery Corp., Washington, D. C.....	Navy, S&A.....	Pumps.....	143,566
Allis Chalmers Mfg. Co., Milw. Wis.	CCC, Interior.....	Graders & tractors.	46,100
The American Laundry Machinery Co., Cincinnati, Ohio.....	Marine Corps.....	Laundry machinery	41,665
United Aircraft Corp., Pratt & Whitney Aircraft Div., E. Hartford, Conn.....	Navy, S&A.....	Engines & parts...	240,282
Bath Iron Works Corp., Bath, Maine	Navy, Ordnance...	Torpedo boat destr.	10,134,000
Federal Shipbuilding & Dry Dock Co., Kearny, N. J.....	Navy, Ordnance...	Torpedo boat destr.	10,164,000
Bethlehem Shipbuilding Corp., New York, N. Y.....	Navy, Ordnance...	Fleet tug.....	1,226,000
George Cole Motor Co., Nashville, Tenn.....	Farm Security....	Adm. Trucks.....	25,280
International Harvester Co., Washington, D. C.....	Farm Security....	Adm. Trucks.....	71,960
Yellow Truck & Coach Mfg. Co., (General Motors Truck & Coach Div.) Pontiac, Mich.....	Farm Security....	Adm. Trucks.....	33,760
General Motors Corp., (Chev. Div.), Detroit, Mich.....	Interior.....	Trucks.....	37,140
The Titusville Iron Works Co., New York, N. Y.....	WPA, Treas., Proc.	Boilers.....	35,560
Revere Copper & Brass Inc., Rome Mfg. Co. Div., Rome, N. Y.....	War, Ordnance....	Brass forgings.....	39,500
Gisholt Machine Co., Madison, Wis.	Navy, S&A.....	Lathes.....	21,562
E. L. Essley Machinery Co., Chicago, Ill.....	War, Ordnance....	Press.....	21,250
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio.....	S&A, Navy.....	Milling machines..	49,526
DeLaval Steam Turbine Co., Trenton, N. J.....	Navy, S&A.....	Pumps.....	81,858
Caterpillar Tractor Co., Peoria, Ill.	Agriculture.....	Tractors.....	21,549
Foster Engineering Co., Newark, N. J.....	Navy, S&A.....	Valves.....	45,819
Curtiss-Wright Corp., Curtiss Propeller Div., Clifton, N. J.....	Navy, S&A.....	Prop. power units..	31,250
Bethlehem Shipbuilding Corp., New York, N. Y	Navy, Ordnance...	Constr. of fleet tug.	2,452,000
Electric Boat Co., Groton, Conn...	Navy, Ordnance...	Constr. of submarine.....	9,201,000
General Motors Corp. (Chev. Div.) Detroit, Mich.....	Agriculture.....	Trucks.....	28,453

Plastics for Planes

Europe, apparently, has outdone us to some extent in mass production methods. The War Department now proposes to improve our methods, and is taking steps toward that end, which will be made public before long. Some improvement will come naturally when large orders are placed. One of the main reasons why airplanes are still made largely by hand is that volume necessary to pay for jigs, dies, fixtures, has been lacking. Some mass methods have been uneconomical, not impractical.

But metal-working should watch its laurels. Important experiments are being made with wood and plastics. The Spanish war has demonstrated in some cases bad ripping of metal covering by gun fire. Also, all-metal ships are very difficult to repair after a crash. Winding wood "ribbon" with plastic instead of glue, around a form from which it is later removed as a tough, water-proof body section or wing, is being tried with some success. Experiments with molded and laminated plastic have been going on here and abroad for years. It's a safe bet something will come of these efforts, some time. But incendiary bullets are mighty hot, and pilots will object to flying veneer furniture around among them.

Commercial Orders

In the commercial field, the outlook for increased production is equally optimistic—(with apologies to those who decline to think of the military picture as optimistic). The last session of Congress passed a civil air law replacing the old Post Office air mail contracts with certificates of convenience and necessity, issued by an independent Civil Aeronautics Board. As a result, the air transport system is expected to expand, with increased demand for new and bigger equipment. Over-night delivery of all first class mail is overdue in this country. Such service is already common in Europe. When this comes it will demand more carrying capacity, possibly mail-only planes. Air express, which has made little progress for years under a handling contract with Railway Express, is due for reorganization, possibly as a Post Office air parcel post service. Authorities say that express volume might well equal present passenger and mail loads combined if low rates and complete pick-up-and-delivery coverage could be offered.

DETROIT LETTER

Parts plants in small towns should prove stumbling block to UAW's plan to equalize wage rates in the industry . . . Will labor flare up despite the trend toward conservatism? . . . New equipment buying lags . . . Dodge trucks opens new plant, announces a diesel

RUPERT LE GRAND
Detroit Editor, *American Machinist*

DETROIT—Equalization of wage rates in the automotive parts industry, the newest aim of the United Automoible Workers, appears impossible of fulfillment. For one thing, the ramifications of the industry are enormous with respect to kinds of plants and worker classifications (the union is understood to be working on only 120 of the latter). But far more important is the difficulty of bringing shops in small communities into line. And these are the ones providing the "destructive" competition that Homer Martin wishes to stamp out.

The parts industry employs about $250,000 workers at peak production. Wheels, carburetors and instruments are only a few of the diverse products, but they involve many more degrees of skill than the UAW is proposing to classify for the purpose of establishing wage rates. Steadily rising labor costs in closed-shop communities have driven much of the business into upstate Michigan, Wisconsin, and northern Indiana and Ohio. Plenty of labor can be found in small towns to work for 35-65 cents per hour, and the productivity of this unorganized labor is said to be frequently higher than union labor. Many women are tending machines or performing assembly operations.

Under a system of free enterprise these small unorganized plants are undeniably within their rights in going after the parts business. Their competition is "destructive" in the sense that concerns operating under closed-shop conditions are frequently unable to compete because of a wage scale averaging over 90 cents per hour. Some machine tenders in Detroit get $1.10. Few of the plants in bigger cities, where union organizing has been effective, have moved machinery to small out-state shops. In several cases they have equipped such plants, and in other cases they have sub-contracted the work. But by and large they have been at a serious disadvantage, and both their managements and their employees have become restive.

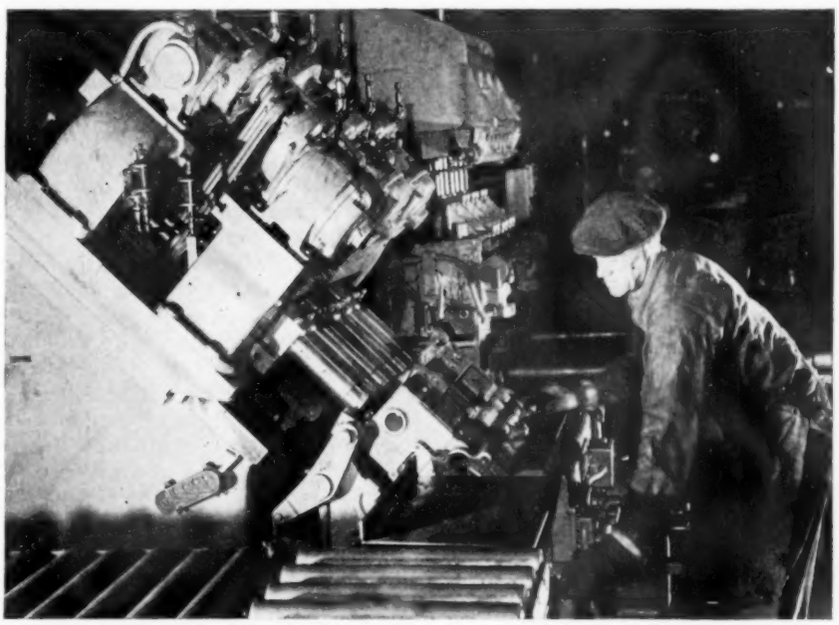
To meet this situation the UAW is expected shortly to approve a model contract and to submit it to a few chosen manufacturers. Observers feel that its main purpose is to secure contract renewals. They are unable to see how a 65-cent minimum can be made to stick in the entire parts industry.

It seems inevitable that closed-shop proprietors may be emboldened to demand downward revision of wage scales in an attempt to hold or regain business. It must be remembered that 1939 cars are cheaper and include in addition many former "extras" as standard equipment. While Mr. Martin is understood to have said that he has the support of Edsel Ford in giving preference to suppliers paying "fair" wages, it is doubtful that automobile purchasing agents generally will be in a position to adopt a policy of dealing with concerns on a "preferred" list.

In the final analysis, the success of the UAW wage-equalization scheme depends on getting into the small plants. Its record in small communities has not been particularly good. Moreover, an increase in conservative sentiment would work strongly against further labor trouble. For these reasons, observers feel from present knowledge that the model contract is probably bait to prevent wage cuts in closed shops. And they are also of the opinion that the purpose of equal wages for men and women is to drive the latter out of industry.

That conservative opinion is increasing was demonstrated by the recent elections in Michigan and Ohio. Its greatest strength lay in the rural areas and the smaller manufacturing towns. Heavily industrialized areas like Wayne County backed New Deal candidates, and the labor vote was preponderantly for Gov. Murphy. Yet in some instances factory employees swung away from their expected choice. For example, in Pontiac workers in one plant conducted their own poll, with a 2-to-1 vote for the Republican candidate.

It is too early to appraise what effect the Republican victory is going



Does Away with Reaming—Pontiac has installed this Ex-Cell-O precision boring machine, from which the cylinder blocks go to honing, eliminating reaming. Tungsten carbide tools give 500 blocks per grind and remove 0.016–0.018 in. per side of the bore

to have on the policies of labor leaders. Many plant executives have been apprehensive of flare-ups regardless of how the election went. They were of the opinion that a New Deal victory would be a signal for excesses, that election of Fitzgerald would not prevent some kind of demonstration either shortly after election or in January. Of course, the governor-elect and the Detroit city government have taken a stand against intimidation of workers. Whether an attempt will be made to call their bluff is a matter for the future.

Meanwhile the automotive industry is striving to produce a million cars before the end of the year, or one-third of preliminary estimates of the total 1939 model production. Buick, the bellweather of the industry, raised its original quota from 200,000 to 260,000 units, the biggest program in its history. Employment has been increased to in excess of 14,000, and more than 9,000 have been rehired since the 1938 low point. All other producers except Hupp have gotten over the preliminary hurdles.

Rising production is not, however, having much effect on equipment buying. Some replacements continue to be made, particularly in high-production machine tools. New programs have been held off until fears of labor trouble subside and factories decide to put further improvements into their 1939 products in line with their thinking last June.

Dodge Truck has opened its new $6,000,000 plant for body building and for assembly of 700 commercial vehicles per day. The plant has unusual lighting and freedom in mounting overhead equipment. All sheet metal is rust-proofed and then spray painted in the latest hydro-filter booths located on a gallery. Body components are assembled in latest-type welding jigs before going to the gallery. Welding is controlled by newly-developed electronic tube controls. Squeeze riveting of brackets to frames is done by portable riveters powered by individual hydraulic pressure generators.

The plant's 50 conveyors extend more than 7 miles. In addition, inside receiving docks and wide aisles permit easy transfer of skid platforms to proper points in assembly. The plant is distinctive for the large amount of room available for further production needs and parts banks.

Dodge Truck in introducing a 3-ton diesel model this year after 10 years' experimentation in the oil-burning field. The 6-cylinder, 4-cycle motor has energy-cell controlled combustion and smoke-free operation. Structural dimensions correspond to the gasoline truck engine, so that the diesel, which gives comparable performance, can be used for replacement without transmission complications.

Time-Defying Autos Seen by D. A. Wallace

DETROIT—75,000 of miles of driving should not effect the mechanical fitness of cars produced four or five years hence, in the opinion of D. A. Wallace, president of the Chrysler Sales Corp., and the man who is responsible for development of the "Superfinish" process. He made this statement before the Swedish Engineers Society of Detroit, of which 150 members were entertained at dinner at the Chrysler Jefferson plant. Mr. Wallace spoke on "Superfinish and Why it Eliminates Wear."

Wear is eliminated by the process because it removes the ridges present on the surface of the work, as left by machining and finishing methods. If the ridges of scratches are absent there is no medium to cut through an oil film between parts running together under load, and the actual supporting surface for the oil film is much greater. Wearing in of mechanisms is not required, dimensional accuracy is maintained, and inaccuracies arising from wear are not present. As a consequence, original fits are maintained indefinitely. An excessive amount of dirt would be necessary to create scratches in the hard crystalline surface left on the metal by the Superfinish process. Its secret of success is cutting off the soft "smear metal" or amorphous metal present in the ridges of the scratches and getting down to the hard crystalline structure underneath. Surface conditions are controlled by the Abbott "Profilometer."

Chrysler divisions have been using the process for two or three years on a large number of parts and will extend it as fast as machinery can be designed and installed. As a matter of fact, the process will cause the elimination of a number of machining processes, and cause changes of method and reduction in over-all cost of the part. Camshafts, for example, will be rough turned and superfinished to mirror-reflecting qualities without intervening machining or finishing operations. Pistons will be diamond turned, ground lightly perhaps, and superfinished. Where grinding precedes the superfinishing, a coarse-grain, free-cutting wheel gives a surface that is cut down by the process in less time and with better results. Very little power is used, the secret being to use only a few pounds pressure on coarse stones that cover the width of the surface. As many as six motions are employed between the work and abrasive, insuring both flatness and complete removal of the "smear metal." Motors of 1/16 hp. are used.

The audience included engineers and shop men from several car companies, including Cadillac, Pontiac, Hudson, Packard and Ford. Other companies now installing equipment are Ford for superfinishing the faces of transmission gears and Pontiac for bearing seats in the rear axle.

Trade Associations to Provide Information

WASHINGTON—The Bureau of Foreign and Domestic Commerce has sent questionnaires to approximately 2,300 national and interstate trade associations in an effort to obtain information for inclusion in a report to the Temporary National Economic Committee. Constituting the first concerted effort to obtain accurate data regarding the various trade organizations, the survey has aroused widespread interest among trade association officers, many of whom offered valuable suggestions in its preparation.

Because the questionnaire has been prepared with the help of many executives with an intimate knowledge of the problems involved, the Bureau staff believes it will be easy to fill out, and therefore anticipate an early return.

Welding Society Plans International Society

NEW YORK—The thirteenth international congress of carbide, acetylene, oxy-ocetylene welding and allied industries is planned to be held in Munich, Germany, the last week in June, 1939.

The purpose of the congress will be to promote and discuss questions of scientific, technical and economic nature concerning acetylene and the oxy-acetylene process. Because of its importance in metal fabrication, oxy-acetylene welding will receive special emphasis.

Lectures and reports by internationally known experts are planned for the congress. In addition, a technical exposition to be held simultaneously will show the status of the various related fields.

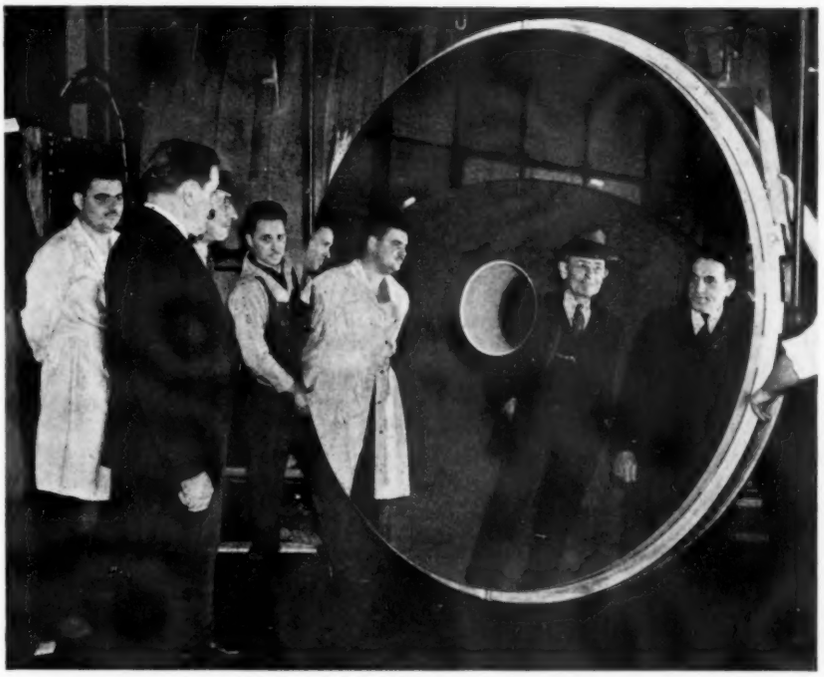
Japanese Demand for Used Machines Rises

TOKYO—For many years Japan has been one of the best markets for used and rebuilt machine tools. Recently, however, two conflicting tendencies have developed in regard to the importation of second-hand and rebuilt equipment. The positive tendency is the fact that rebuilts are available on shortest delivery terms and that they are substantially cheaper than new machines and accordingly easier to maneuver through the red tape of the government exchange license bureau. Opposed to these obvious advantages is the fact that importation of machine tools is at present confined to such units as are required by the armament industry, and that in this industry precision and top-notch performance are everything.

Up to last summer imports were heavy, but tighter official grip on exchange bill negotiations gradually narrowed down the number of tools which entered Japan. Lately, however, the outlook has become brighter, and Japan is likely to draw again on the available stocks of American second-hand and rebuilt machines, since there are better buying opportunities in the United States than elsewhere in view of the large-scale retooling in U. S. plant.

The exchange situation has become so serious that the authorities are compelled to restrict the amount of exchange bills under all circumstances, so that insistence on importation of high-priced new machines, however emphatically endorsed by the defense services, occasions additional delays in the issuing of licenses. It is also noted that the officials are recently conniving at the splitting of bills, there being in fact very little restriction of late on the importation of several units of low price in place of a single specified unit of high price on which the license was issued. Hence the trend is toward importation of more rebuilt and second-hand machines and fewer new machines.

Japanese firms handling European machine tools have emphatically denied rumors that the European crisis has affected delivery terms. Although it is admitted that the European principals are still preoccupied with munitions orders from their own governments, their ability to build machine tools for delivery to Japan has not been affected. On the contrary, it is stated that both English and German firms are likely to obtain the support of their governments in pushing overseas sales in view of the adverse trade balance of these countries.



Reflects Progress, Too—Said to be the most accurate ever tested, this 82-in. telescope mirror has just been completed by the Warner & Swasey Co. for the new McDonald Observatory in Texas. Having a deviation of less than a millionth of an inch, its parabolic surface is finished with special coatings of chromium and aluminum. Reflected in the mirror are Stephen Mendel, optical department; George A. Decker, works engineer; and C. A. Robert Lundin, optical department director

A.S.T.E. to Sponsor Machine and Tool Progress Exhibition

PITTSBURGH—Plans for the 1939 Machine and Tool Progress Exhibition in Detroit got under way with the approval of preliminary details by the board of directors of the American Society of Tool Engineers. The directors' meeting was held coincident with the first semi-annual convention of the society at Pittsburgh.

As a result of the success of the 1938 show, which attracted over 23,000 visitors, plans have been made to triple the floor space available for exhibitors. Arrangements are being made to handle 50,000 visitors.

Frank Shuler, associated with Chrysler Corp., and last year's president of the A.S.T.E., has been appointed chairman of the committee in charge of the show, which will be held simultaneously with the national convention of the A.S.T.E. in March.

This convention is also expected to more than double its last year's attendance, in view of the society's growth during recent months. In the last year chapters have been added in such industrial centers as Cincinnati, Schenectady, St. Louis, Syracuse, York, Dayton, Philadelphia and Rochester. Several additional chapters are expected to be chartered before the 1939 show gets under way.

Opening unofficially on Monday, March 13, the show will last six days through Saturday night, March 18. A number of improvements over the 1938 show have been incorporated in the plans for the coming exposition. Among these are numbered better arrangements for handling shipments to the show, increased electric power facilities, and better handling of attendance.

New England Governors Head Conference

BOSTON—The Fourteenth Annual New England Conference, organized to promote coordination of efforts for the solution of economic problems common to the six New England States, will be held at the Hotel Statler in Boston on Nov. 17 and 18. Representatives of industrial, agricultural, recreational and commercial associations, business leaders and government officials will meet with the New England governors in an effort to promote economic welfare.

WATCHING WASHINGTON

Evasions and technicalities of Wage-Hour law claim attention of Andrews . . . Increased demands by steel labor union expected . . . Companies to be questioned by anti-monopoly committee . . . Educational orders program proposals in mail

McGRAW-HILL WASHINGTON BUREAU
(*Paul Wooton, Chief*)

WASHINGTON—A real show-down confronts Wage-Hour Administrator Elmer Andrews. Employers want to know whether they can legally cut wages of employees on a work-week in excess of 44 hours, and use the saving to pay time and a half for overtime, thus continuing the *status quo*. The law merely says that cutting wages as a result of the act shall not be justified. But Mr. Andrews issued a ruling that overtime must be based on "going" wages, not on a reduced wage. Many employers are advised by counsel that the law merely expresses a Congressional wish, and that Andrews' ruling would not be upheld in court. They think it is doubtful if Congress can, under the constitution, freeze wages by forbidding wage cutting. Andrews says that if wages can be cut to pay over-time there is no point to the law. Upper-bracket workers would lose more than below-25-cent workers gained. National Association of Manufacturers' challenge will encourage test cases. If a case gets to the Supreme Court and a ruling goes against labor, the unions will turn on the heat in Congress for an amendment. Best opinion here is that employers should be wary. Decisions against them with orders to pay back overtime might be a heavy penalty.

Higher Steel Wages?

Steel Workers Organizing Committee is expected to take full advantage of high minimum wages recommended by the Public Contracts Board by demanding increased wages when present union contracts expire. Organized labor will also urge Secretary Perkins to put the Board to work on minimum wages in steel fabrication for government contracts. Employers have 21 days from November 7 in which to file a protest against the Board's recommendations before Secretary Perkins issues her order. At this writing none has been received. Objections are expected to come from independents. Big Steel is thought here to be pleased that its smaller competitors are getting their wages jacked up. Some think that the differential between 62½ cents in the North and 45 cents in the South is not wide enough. The Board has left that open to further study. There seems to be no apprehension that the government will be crippled in any way by firms that might shy off further federal contracting. But trouble is possible. Important armament expansion, already on the way, may demand full capacity of government arsenals, shipyards and the private metal-working industry. The War Department is frankly depending more on industry than at any time since the war. Some firms undoubtedly will oppose the wage boosts vigorously. The industry knows, however, that it can nettle the Administration only so far; then there is talk of taking over basic resources.

Steel Mills Quizzed

Because the Temporary National Economic Committee (anti-monopoly committee) believes that steel is fundamental in the whole industrial structure, it is planning to mail an elaborate questionnaire to iron and steel companies. The questionnaire is being prepared under the direction of the Department of Justice and the Federal Trade Commission, following a joint meeting with industrial representatives in New York. The questions will cover capacity, production, shipments, prices. Preceding the questionnaire will be a letter which will inquire into methods of record-keeping. The answer to this will help the committee frame answerable questions.

RFC Boosts Exports

First result of a trip around South America by a representative of the government-owned Export-Import Bank (branch of RFC) is participation by RFC in financing the sale of four American Locomotive units to the Sorocabana Railway of Brazil. RFC is negotiating loans for shipment of more railway equipment to South American countries. Probably the program will bring about the sale of other heavy goods.

Educational Proposals Mailed

Circular proposals on five items in the educational orders program are now being mailed out. Specifications regarding the 60-in. searchlights, the sixth item, are not yet ready. Dismay is expressed over the fact that some of the proposals are extremely complicated may require weeks of calculation. Procurements officers again emphasize that a very high degree of selection of companies prevails in inviting bids. Any bid can be rejected "in the public interest," and any offer can be further negotiated under the provisions of the new law.

REPUBLICAN CHEER

Most significant outcome of the elections for industry was the trouncing taken by Governor Frank Murphy in Michigan. Outside of New York State, President Roosevelt and Madame Perkins were more interested in reelecting Governor Murphy than in anything else. Mr. Roosevelt had blessed the Governor because of his action in condoning the automobile sitdown strikes last year. It is significant that the Governor's vote in Detroit and in Flint was much smaller than two years ago before his sitdown strike activities.

Another blow to the White House and to Madame Perkins, as well as to the political aspirations of the New Deal, was the failure of New Dealers Sawyer and Bulkley in Ohio to roll up the expected leads in such industrial centers as Cleveland, Akron and Youngstown. This is even more significant if one recalls that Akron's vote alone prevented renomination of Governor Davey in the primaries.

Vice-President Garner had his first split with Mr. Roosevelt over federal handling of sitdown strikes. It has been a little-discussed issue between the White House and the Congressional conservatives ever since. The conservatives now have proof that politically Jack Garner was right, entirely aside from the merits of the case. This spells a different line of action on Capitol Hill from now on. Incidentally, the new Republicans are not what would have been called conservatives awhile back. Many are Townsendites. But the main thing is that political expediency no longer dictates cowtowing to C.I.O. tactics.

Electro-Motive Corporation Plans Freight Locomotive

CHICAGO—Business paper and newspaper editors paid their first formal respects to the new addition at the Electro-Motive Corp. plant in La-Grange, Ill., recently. That day a multiple-unit diesel locomotive left the factory for delivery to the Seaboard Airline Railway. Said to be the most powerful ever constructed, it is a three-unit locomotive, each unit having two engines delivering 1,000 hp. each. Two additional three-car units are being assembled for the same railroad.

Operations in the 300,000-sq. ft. addition to the plant have been under way for several months. Part of this addition is for the purpose of manufacturing the diesel engines for locomotives, which was formerly done at the Winton plant in Cleveland.

Since January, 1936, $25,000,000 worth of manufacturing materials, of which $22,000,000 was in locomotives, has been turned out from this plant. Of the 225 diesel locomotives built here, 50 are being used in high speed train operations and the remainder as switching engines.

H. L. Hamilton, president, revealed that engineering plans were under way for diesels capable of delivering enough horsepower for a railroad freight train in road haul service.

C. E. HERINGTON

Hans Ernst Addresses Meehanite Institute

ROCHESTER—Over 40 research papers on a variety of subjects were presented at the annual meeting of the Meehanite Research Institute held in Rochester recently. Outstanding among these was a discussion on "The Physics of Machining" given by Hans Ernst, director of the research department of the Cincinnati Milling Machine Co.

It was announced by the Institute that C. E. Herington had been appointed director of publicity and advertising manager for the organization, with headquarters in Pittsburgh. Mr. Herington was previously connected with a firm in that city serving many leading industrial concerns.

O. Smalley, president of the Meehanite Metal Corp., Pittsburgh, was reelected president of the Meehanite Research Institute at the meeting. Also reelected were H. B. Hanley, foundry manager of the American Laundry Machinery Co., Rochester, as vice-president; and F. M. Robbins, president of Ross-Meehan Foundries, Chattanooga, as secretary-treasurer. A. C. Denison, president of the Fulton Foundry & Machine Co., Cleveland, was named chairman of the research committee while P. E. Rentschler, president of the Hamilton Foundry & Machine Co., Hamilton, Ohio, was appointed chairman of the advertising committee.

Charles R. Hook Announces Meeting of Congress of American Industry

NEW YORK—The call for the 1938 meeting of the Congress of American Industry, annual gathering of the nation's manufacturers, was issued recently by Charles R. Hook, president of the National Association of Manufacturers, which will sponsor the sessions of the Congress to be held this year in New York City from Dec. 5 through Dec. 9.

The Congress comprises the annual meeting of the National Industrial Council, a federation of national, state, and local industrial associations which will meet on Dec. 5 and 6, and the annual convention of the National Association of Manufacturers which is scheduled for Dec. 7, 8 and 9.

Among those who have already accepted invitations to address the Congress, one of the largest of such gatherings held in this country, are Senator Joseph C. O'Mahoney, chairman of the Temporary Economic Committee, who will speak on "Regulation of Business Competition"; and the Honorable Elmer Andrews, Administrator of the Fair Labor Standards Act. Mr. Andrews will discuss the Wage-Hour Act, which will then have been in effect for more than a month.

Others on the list of speakers for the Congress include: Dr. George Gallup, director of the American Institute of Public Opinion; H. L. Derby, president, American Cyanamid Co.; Dr. Paul Cadman, president, American Research Foundation; and Dr. Victor G. Heiser, chief consultant of the N.A.M. committee on healthful working conditions.

As is customary, the final day of the Congress will be designated as "Labor Day" with the problems of building sound employment relations being the chief topic of discussion.

Bureau for Motor Vehicle State Laws Planned

NEW YORK—Representatives of 22 trade associations were present at the Motor Vehicle Industries Conference, which unanimously favored a plan to coordinate information on state legislation through a central source. Since state laws affecting motor vehicle interests are multiplying with much rapidity and confusion, it was felt that a committee could perform valuable service to trade groups.

Some of the major issues in the 44 states where legislation will be enacted during the forthcoming session will be: gasoline tax rates, registration fees and dates of expiration, diversion of highway funds, traffic regulation, dealer licensing laws, labor legislation, sales taxes and other direct and indirect taxes.

Trade groups which are vitally affected by the prospects of the new laws include manufacturers and producers of raw and processed materials, automobile and accessory dealers, highway machinery and materials manufacturers and makers of cars and trucks.

Foundrymen Plan to Meet In Cincinnati

NEW YORK—The American Foundrymen's Association has chosen Cincinnati as the place for its 1939 Annual Convention which will be held from May 15 through May 18. The entire program will be devoted to technical, management and general interest sessions, shop operation courses, round table discussions and visits to nearby plants.

English Shadow Plant Program Expanded As Government Speeds Rearmament

Rumors that plan is a failure are reported without foundation as minor troubles are straightened out

LONDON, ENGLAND—Judged by the speed with which most factories have been brought into production, contrasted with delays in certain other sections of the rearmament drive, the British shadow plant program is proving to be a success. Reports to the contrary are believed unfounded, though little information about the internal working of the shadow scheme is available.

"Shadow plants" is a name no longer being applied to factories included in the original shadow plant program. They are now officially known as government factories. The term "shadow" was coined presumably to avoid arousing antagonism of those who think the government should not engage in industry under any circumstances. "Government factory," however, as a designation is likely to lead to some confusion because the new plants are in nowise comparable with the royal ordnance factories where the personnel is engaged and paid by the government. Under the shadow scheme the government furnishes the capital to erect the factory which is then managed on behalf of the government by private industry.

Since details of the shadow plant program were revealed a number of additional factories have been planned. Magnesium Elektron Ltd. is to manage a factory for production of magnesium alloys. A second carburetor plant is being established at Coventry under management of Standard Motor Co., Ltd., which already is responsible for one of the aero-engine factories. A factory is being built at Heywood, Lancashire, at a cost of 1,000,000 pounds to manufacture aircraft instruments.

More Plants Begun

Lord Nuffield, who originally declined to participate in the shadow plant program because of differences with the Air Ministry, is now building an airframe factory on a 135-acre site at Castle Bromwich. (An "airframe" is a finished plane minus the engine.) The plant will make "Spitfire" fighters and an original order for 1000 machines has been placed. The "Spitfire" is claimed to be the fastest military plane in the world. It is designed by Supermarine Aviation Works, subsidiary of Vickers Ltd. The factory will cost 3,000,000 pounds and will employ 12,000 to 15,000 men.

To assure an adequate supply of Rolls Royce Merlin engines for the "Spitfire," Rolls Royce Ltd. is erecting a shadow factory at Crewe. Rolls Royce at first refused to participate in the shadow plant program because the management disagreed with the policy of producing only a small range of parts in each factory and because the disclosure of their production processes would have been involved.

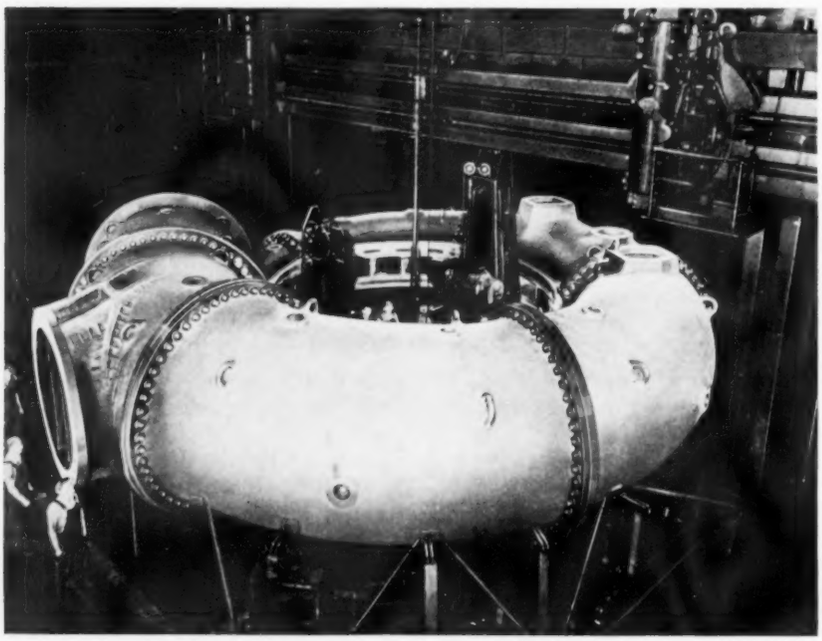
Latest shadow plant is that of A. V. Roe & Co. at Greengate, Chadderton, near Oldham which will make airframes, principally bombers. The factory will employ about 5000 men. A. V. Roe & Co. has long been on the Air Ministry list as suppliers of military aircraft. It is subsidiary of Hawker Siddeley Development Co., Ltd.

Additions are being built to some of the original shadow plants. Bristol Aeroplane Co. is constructing an extension at cost of 1,500,000 pounds. The airframe factory at Speke managed by Rootes Securities Ltd. is being expanded 40 per cent; eventually this plant will make four airframes a day and employ 6000 men. Short & Harland Ltd. at Belfast is adding to its plant on "shadow" principles, though it originally was not a shadow plant. The company has been encouraged by the government because of its excellent strategic location. It was formed by cooperation between Short Brothers Ltd., flying boat builders of Rochester, Kent, and Harland Wolff Ltd.

Original Plan Changed

Original idea of the shadow scheme was that plants should be built and equipped for operation in time of emergency and then shut down until needed. But the rearmament program made it necessary to use all the factories to full capacity immediately. It is understood to be the government's plan as soon as the international situation permits to close down the shadow plants and place them on a care-and-maintenance basis.

There has been some labor trouble at shadow plants. In June a three-day strike occurred at the airframe plant of Austin Motor Co. following a dispute over the timing system for assessment of earnings. On Aug. 29 a more serious strike took place at the same company involving 5000 men. Grievances were that rates of pay were the same as in the company's motor works, whereas the



Casing Bored for Boulder Dam—The largest machine tool on the American continent, the 40-ft. boring mill in the Milwaukee plant of the Allis-Chalmers Mfg. Co. goes to work on the casing for a 115,000-hp. turbine to be installed at Boulder Dam. Weighing over 200 tons, the cast steel assembly was made of six sections for convenience in shipping

work involved in aircraft construction was more highly skilled, and that the company had not observed the minimum wage rates laid down. The strike was unofficial in that it did not have the backing of the Trades Unions which took the attitude that the men should return to work and start negotiations with the management through the union. Strikers tried unsuccessfully to enlist sympathy of workers in other aircraft factories, but the union view prevailed and the strike ended Sept. 9. Since negotiations are between the Amalgamated Engineering Union and the Engineering & Allied Employers' Federation, it is expected that they will cover the entire question of wage rates in shadow factories.

S. S. Scott Announces Third Welding Course

NEW YORK—Arrangements have been made by the New York Section of the American Welding Society with the Polytechnic Institute of Brooklyn for the presentation of a series of lectures dealing with modern developments in the field of welding, according to an announcement by S. S. Scott, chairman of the course.

Extending over a period of four months, the course will include discussions concerning metallurgy, welding of alloy steels and non-ferrous metals and alloys, testing procedure, structural welding, design and estimation of costs. The Welding Handbook, recently published the American Welding Society, will be used as a background, with additional information contributed by many prominent individuals in the field.

Electroplaters to Meet At Asbury Park

NEW YORK—The American Electroplaters Society will hold its 1939 Convention at Asbury Park, N. J. during the week of June 19. With activities centered at the Convention Hall, the meeting will be under the supervision of the Newark branch of the society with Horace H. Smith, past president of the organization, as general chairman.

Further details of the convention may be obtained from the executive secretary of the society, W. J. R. Kennedy, 90 Maynard St., Springfield, Mass.

Control of Costs and Quality Stressed At Management Association Conference

Manufacturing executives also focus attention on problems of inventory control, compensation and job evaluation

NEW YORK—Over 300 executives in charge of manufacturing operations in factories throughout the country met Nov. 9 for a two-day conference sponsored by the American Management Association. Under the supervision of Raymond S. Perry, vice-president of the Ingersoll Milling Machine Co. and vice-president in charge of the A.M.A. Production Division, the manufacturers devoted the greater portion of their time to considerations concerning quality and cost control, wage payments and job evaluation.

Speaking during the symposium on unit costs, Alvin E. Dodd, president of the A.M.A., pointed out that control of these factors had been made more difficult by rising taxes, increased costs of many types of materials, wages-and-hours legislation and similar measures. "In spite of the emphasis on personnel and industrial relations in recent years, it is still the job of the production executive to produce his product at the lowest possible cost consistent with quality," Mr. Dodd asserted.

Earl M. Richards, assistant to the vice-president in charge of operations of the Republic Steel Corporation, outlined the four fundamentals that have been employed by this company in lowering unit costs. These were: installing improved equipment; improving the layout of existing equipment; operating some plants at a constant predetermined rate regardless of orders; and renewed emphasis on existing control and incentive systems. Mr. Richards also emphatically denied that installation of improved equipment in his company put men out of work

During the symposium on costs today, Earl M. Richards, assistant to the vice-president in charge of operations of the Republic Steel Corporation, said that four fundamentals have been employed in his company in lowering unit costs. These were: 1. Installing improved equipment; 2. Improving the layout of existing equipment—or a combination of this method with the foregoing; 3. Operating some plants at a constant predetermined rate regardless of orders; 4. Renewed emphasis on existing control and incentive systems.

Machinery Exporters Emphasize Problems in Latin America

NEW YORK—Difficulties in connection with exporting machine tools to Central and South America comprised the chief topic of discussion at the Machinery Group Session of the National Foreign Trade Convention. Although the situations in Europe and the Far East received their share of attention, problems involved in doing business with our neighbors to the south received by far the greatest amount of emphasis.

Carl W. Linscheid, export manager of Fairbanks, Morse & Co., and president of the Machinery-Metals Export Club, led the discussion among the exporters and their guests. Lewis M. Lind, chief of the machinery division, Bureau of Foreign and Domestic Commerce, acted as counselor.

Although it was the opinion of the majority of delegates that the brightest future for American machine tool exports lies in Central and South America, it was also brought out that these markets offered by far the most difficult problems. Not only are the usual difficulties in connection with long-term financing involved, but in these fields competition from Germany—with its discount on marks, barter arrangements, and direct subsidies—is so intense that it constitutes a veritable stranglehold on American trade. Although Germany is, relatively speaking, in about the same position as an exporter to South America as she was before the war, she is rapidly forging ahead in this territory to the detriment of American interests.

Machine Tool Index Shows Slight Gain

CLEVELAND—The index of machine tool orders as released by the National Machine Tool Builders Association has risen from 117.4 in September to 118.1 for October. Although the index is considerably lower than in October 1937, the three months trend continues upward.

Outlook Remains Bright For Machinery Exports

NEW YORK.—Machine tool exporters to the Far East are gradually feeling the pinch of Japan's diplomatic and commercial tie-ups with the dictatorships. By means of barter agreements and credits, Germany has driven American and British competition from Manchuria, and it is said that a considerable number of German machine tools are finally finding their way into Japan. A recent trade agreement has also opened some Far Eastern markets to Italy. Deliveries from that country are said to require only four months, and prices are slightly below German, British and American quotations.

Opinion is divided on the effects of Japan's efforts to "close" the "open door" of China. Exporters of rebuilt machinery are inclined to think they will eventually lose their entire Eastern market to Japan, while several manufacturers feel that any "development" of China can do nothing but benefit them.

South American demand has slackened little, despite the fact that at this time of year it normally falls off considerably. Activity in the Argentine remains good, that in Brazil seems somewhat better, while that in Colombia, according to several authorities, is best of all. In this latter country, however, exchange regulations constitute a major obstacle.

The situation in Mexico is materially improving. Railroads are doing considerable buying, and the government is expected soon to embark upon a heavy spending program. Here again the main difficulties lie in the exchange restrictions.

Buying in Europe continues spotty. The interest of most countries is concentrated on quality precision equipment as a result of frantic rearmament activities. Russian demand recurs intermittently; credit difficulties present an appreciable obstacle to trade. Occasional exporters are bebinning to do business in South Africa, in spite of the commercial strength of the British there.

Sentiment among representative machine tool exporters in New York is that their foreign business will continue for several months at its present satisfactory level, with many dealers expecting a gradual improvement. All however, vision the development of South American markets as the brightest star on the horizon, and feel that once the exchange difficulties are ironed out, even Germany won't be too formidable a competitor.

Grand Central Palace Will House Power and Engineering Exposition

NEW YORK—Over 250 exhibitors have already engaged space for the thirteenth National Exposition of Power and Mechanical Engineering to be held in Grand Central Palace, New York City, during the week beginning December 5. Indications are that with gradually improving business, manufacturers are taking an increased interest in the exposition. Occupying three floors of the building, the exhibits are expected to attract over 40,000 interested visitors.

Sectionalized models and working demonstrations of equipment will be featured in that part of the exposition devoted to valves and fittings An interesting study in thermodynamics will be provided by a working model of a complete power plant. Other working models will include an oil filter in operation and set-ups designed to present the functioning of the latest types of boiler room instruments and controls.

Transmission devices on display will include V-belts, round and flat endless belts, belt fasteners, industrial hose, silent and roller chain drives, flexible couplings, variable speed units, clutches, speed control units, gears, sprocket wheels, speed reducers and various types of ball and roller bearings.

Among the tools and machines to be exhibited will be a selection of bronze tools capable of cutting steel. Products machined from centrifugal castings of this alloy include gears, bushings, cylinder liners and dies. A half-inch electric drill with a weight half that of conventional drills will be the center of a display animated by a miniature workshop with all the equipment in operation. Featured in other exhibits will be automatic saw filers, die filers and markers, metal-cutting saws and threading equipment, in addition to all types of standard machine tools and numerous miscellaneous specialties.

The thirteenth National Exposition of Power and Mechanical Engineering will be under the management of the International Exposition Co., New York, N. Y.

Exports of Machinery During September, 1938

	September 1938	August 1938	September 1937
Electrical machinery	$7,299,055	$8,084,328	$8,995,024
Power generating machinery except automotive and electric	913,622	1,384,950	1,322,998
Construction and conveying machinery	1,813,839	1,933,230	2,065,726
Mining, well and pumping machinery	4,915,233	5,240,719	4,640,089
Power driven, metal-working machinery	8,144,947	8,625,729	3,901,722
Other metal-working machinery	250,610	332,580	358,214
Textile machinery	338,863	449,557	1,024,801

Exports of Metal-Working Machinery During September, 1938

Engine lathes	395,204	862,288	206,665
Turret lathes	426,372	296,500	365,039
Other lathes	224,765	181,034	89,965
Vertical boring mills and chucking machines	330,760	500,452	193,633
Thread cutting and automatic screw machines	292,039	187,892	238,854
Knee and column type milling machines	230,445	332,223	223,911
Other milling machines	924,441	1,214,704	162,601
Gear-cutting machines	218,750	236,361	156,045
Vertical drilling machines	42,245	105,030	38,082
Radial drilling machines	9,881	17,450	68,288
Other drilling machines	236,253	142,144	104,972
Planers and shapers	282,446	256,416	73,891
Surface grinding machines	264,047	338,304	178,150
External cylindrical grinding machines	302,788	429,427	53,062
Internal grinding machines	227,059	386,792	103,516
Tool grinding, cutter grinding, and universal grinding machines	308,370	306,150	188,624
Other metal-grinding machines and parts	360,639	210,275	111,079
Sheet and plate metal-working machines and parts	693,492	689,867	434,606
Forging machinery and parts	812,251	95,404	.2,784
Rolling mill machinery and parts	861,779	874,220	77,322
Foundry and molding equipment and parts	109,393	228,787	128,430
Other power-driven metal-working machinery and parts	591,528	734,009	642,203

Other Metal-Working Machinery

Pneumatic portable tools	93,938	84,042	90,598
Portable and hand and foot operated metal-working machines and parts	63,879	109,902	131,039
Chucks for machine tools	13,105	29,368	17,913
Milling cutters, machinery operated thread dies and taps and similar machinery-operated metal-cutting tools	43,030	36,749	66,863
Other metal-working machine tools	36,658	72,519	51,801

S.A.E. Schedules World Automotive Congress

NEW YORK—Three weeks of May and June have been set aside by the S.A.E. for the activities of its World Automotive Engineering Congress. Engineers, manufacturing executives and transportation experts from every large country in the world are expected to participate in the activities.

Present plans include five days of technical sessions in New York, beginning May 22, with the Congress officially being opened by Grover Whalen, president of the New York World's Fair. The following week the gathering will journey to Indianapolis, where the members will witness the 500-mile international sweepstakes on May 30. The following three days will be spent in inspecting principal automotive plants in Detroit, and the Congress will be closed with three days of technical sessions in San Francisco, where the delegates will have an opportunity to visit the Golden Gate Exposition.

Papers scheduled for presentation at the various technical sessions of the Congress will include discussions of aircraft, aircraft engines, diesel engines, fuels and lubricants, passenger cars, bodies, production, tractors, transportation and maintenance, trucks and buses.

PERSONALS

W. B. McSKIMMON

G. W. WOLF

W. B. MCSKIMMON, president of the Union Twist Drill Co., has been re-elected president of the Metal Cutting Institute.

GEORGE W. WOLF, at present operations manager of General Motors Overseas Operations, has been appointed president of the United States Steel Products Co., the export medium of the United States Steel Corp., effective Jan. 1. Mr. Wolf succeeds GEORGE C. SCOTT, who is retiring from active service.

WILLIAM H. BOYLE, former blooming mills superintendent of the Duquesne Works of the Carnegie-Illinois Steel Corp., has been appointed superintendent of rolling in charge of bloom, billet and bar mills. ALEX MONTGOMERY, JR., plant industrial engineer, has been named assistant to the superintendent of rolling, in charge of bar mills. GEORGE L. GALLATIN, previously superintendent of bar mills, has been appointed chief order and schedule clerk. JOSEPH W. KENNEDY, JR., has been named assistant to the superintendent of rolling, in charge of blooming mills; and JOHN W. JORDAN has been appointed plant industrial engineer.

EDWARD G. BURGESS, formerly superintendent of the Toronto Works of the Massey-Harris Co., agricultural implement manufacturer, has been made general superintendent of the company's plants in Racine, Wis., and Batavia, N. Y.

JOHN N. COLLINS, of the Moore Drop Forging Co., Springfield, Mass., has been elected president succeeding the late FRANK D. FULLER. HAROLD G. DICKEY, vice-president, has been appointed general manager.

CHESTER H. GIBBONS, formerly stationed at the plant of the Baldwin-Southwark Corp., Eddystone, Pa., has been transferred to the Ohio district. Mr. Gibbons succeeds A. Q. DAVIS, who was recently appointed shop superintendent of the corporation.

HENRY R. HANSON, formerly with the Latrobe Tool Co., has joined the organization of William K. Stamets, Pittsburgh machine tool dealer.

D. G. HENDERSON has been elected president of the Consolidated Steel Corp., Los Angeles, Calif. He takes the place of REESE TAYLOR, who has been named president of the Union Oil Co.

FRANCIS HODGKINSON, consulting engineer, New York, N. Y., was awarded the Holley Medal for "meritorious services in the development of the steam turbine", at the 59th annual meeting of the A.S.M.E. Also awarded on Honors Night were the Worcester Reed Warner Medal, to LAWFORD H. FRY, railway engineer, Edgewater Steel Co., Pittsburgh, Pa.; Melville Medal, to ALPHONSE I. LIPETZ, consulting engineer, American Locomotive Co., Schenectady, N. Y.; and the Pi Tau Sigma Medal to WILFRID E. JOHNSON, General Electric Co., Ft. Wayne, Ind.

LOU F. KINDERMAN, formerly associated with the Republic Steel Corp. and with Westinghouse Electric & Mfg. Co., has joined the staff of Iron & Steel Products, Inc., Chicago, Ill.

E. T. LORING has been appointed chief engineer of the new Irvin works of the Carnegie-Illinois Steel Corp., according to a recent announcement by company officials. Other appointments at the new plant include: R. J. MACKENZIE, assistant chief engineer; A. L. BILLETER, division superintendent, flat products finishing; A. C. BLEDSOE, superintendent of cold reduction; F. L. SCHWEARINGEN, construction engineer.

Further appointments include: A. C. GRUNKE, maintenance foreman, flat products finishing division; J. V. MAZURIE, maintenance foreman, hot strip mill; M. C. KING, R. H. CROWTHERS and A. POWELL, foremen.

L. B. F. RAYCROFT, Electric Storage Battery Co., Philadelphia, Pa., was re-elected president, National Battery Manufacturers Association.

W. H. RODGERS, of the Westinghouse Electric & Mfg. Co., has been named engineering manager of the company's eastern district, with headquarters in New York City. Mr. Rodgers replaces R. E. POWERS, who has been made northwestern district service manager with headquarters in Chicago.

CARL W. SCHAFFNER has resigned as foundry manager of the Spencer Heater Division of the Lycoming Mfg. Co., Williamsport, Pa., to become general plant manager of Hart & Crouse Co., Utica, N. Y., heating unit manufacturer. L. D. BRADY has been appointed foundry manager of the Lycoming company to succeed Mr. Schaffner.

J. TRUMAN STEINKO has been named advertising and sales promotion manager for the Leonard Division of Nash-Kelvinator Corp., according to an announcement by R. E. LEGG, Leonard general sales manager.

J. R. TOWNSEND, materials standards engineer with the Bell Telephone Laboratories, has been elected a member of the executive committee of the A.S.T.M. Mr. Townsend succeeds ALLEN ROGERS, who resigned recently because of ill health.

E. H. VOGEL, manager of the radio division of the General Electric Co., sailed for Europe Nov. 1 for the purpose of studying television developments abroad. He expects to be gone six weeks, and in that time will discuss commercial television experience with various European agencies.

D. ROBERT YARNALL, chief engineer, Yarnall-Waring Co., Philadelphia, was re-elected president of the United Engineering Trustees.

BUSINESS ITEMS

Billings & Spencer Co., Hartford, Conn., has completed construction of the first of its line of two-spindle fully automatic screw machines. Production rights were obtained earlier in the year from the Windsor Automatic Co., Windsor, Vt. Adapted for an intermediate need between single- and multiple-spindle type machines, the new product is creating widespread interest.

The Edward G. Budd Mfg. Co. has received an order for a seven-car "daylight" type train from the Seaboard Airline Railway. Consisting of all-chair equipment, with observation and lounge facilities, the train is expected to be placed in service on the New York–Florida run by next February. It will be powered by a 2,000-hp. diesel-electric locomotive built by the Electro-Motive Corp.

The Cummins Engine Co., Columbus, Indiana, diesel engine manufacturer, is planning to build a new modern building to be used for the assembly of fuel pumps and injector mechanisms. The new structure will provide 16,000 sq. ft. additional floor space.

Dodge Division of Chrysler Corp., as part of a $6,000,000 expansion program, has put into operation a new building devoted to the manufacture of commercial vehicles ranging from one-half to three ton capacity. Covering 49 acres of ground and providing a total floor area of over 693,000 sq. ft., the new structure makes possible a normal manufacturing capacity of 700 trucks per day.

The Food Machinery Corp., Riverside, Calif., is planning additions to its manufacturing facilities amounting to $21,000.

The Lockheed Aircraft Corp., Burbank, Calif., has been issued a permit for the construction of an addition to its Los Angeles factory. It is estimated the new structure will cost approximately $90,000.

The Howarth Pivoted Bearings Co. has opened offices and a factory in Philadelphia, where it will manufacture an extensive line of thrust and journal type oil-film bearings. H. A. S. HOWARTH, associated with the Kingsbury Machine Works for the past 24 years, heads the new organization.

The Lockheed Aircraft Corp., Burbank, Calif., has received an order from the British Air Ministry for $3,900,000 worth of aircraft spare parts. This order supplements the $18,000,000 English contract for 200 bombers.

The Monarch Machine Tool Co., Sidney, Ohio, as a vital element in its expansion program, will build a modern two-story addition to its present plant facilities. To provide 35,000 sq. ft. of available floor space, the new structure is to be begun immediately.

The Northwestern Steel & Wire Co., Sterling, Ill., has recently been licensed by the Inland Steel Co. to manufacture "Ledloy" free-machining steel.

The New York Belting & Packing Co. has appointed three new distributors, according to an announcement by B. F. RUETHER, general manager. They are: Dodge-Newark Supply Co., Newark, N. J.; Central Jersey Hardware & Supply Co., Perth Amboy, N. J.; Cornell Supply Co., Toledo, Ohio.

The Owens-Illinois Glass Co. and the Corning Glass Works have announced the formation of the Owens-Corning Fiberglas Corp., which will manufacture a variety of products made from fiber glass. The announcement, which was made jointly by AMORY HOUGHTON, chairman of the board of the new company, and HAROLD BOESCHENSTEIN, president, marks the culmination of developmental work by the two companies involving expenditures totalling about $5,000,000.

The Westinghouse Electric & Mfg. Co. has announced the sale of nearly $1,000,000 worth of propulsion and other marine gear to the Standard Oil Co. of New Jersey. This equipment will be used in outfitting a fleet of twelve new twin-screw oil tankers. It is estimated that construction work on these ships will employ about 10,000 workers for a period of three years at the shipyards of the Bethlehem Shipbuilding Corp., the Federal Shipbuilding and Dry Dock Co., the Sun Shipbuilding & Dry Dock Co., and the Newport News Shipbuilding & Dry Dock Co.

OBITUARIES

WILLIAM WESLEY ALEXANDER, former vice-president and general manager of the John Deere Plow Co., St. Louis, Mo., died recently in that city. He was 54 years of age.

JOHN BOYLSTON, founder and head of the Boylston Steam Specialty Co., Chicago, died Oct. 30 at the age of 74.

J. BEN CAMPBELL, until 1936 president of the McNeil Machine & Engineering Co., Akron, Ohio, died Nov. 4. He was 74 years of age.

GEORGE C. COOKE, 65, president of the American Railway Products Co., Chicago manufacturer of railroad safety devices, died of a heart attack on Nov. 8.

LEWIS BEERS CURTIS, president of the Curtis & Curtis Co., Bridgeport, Conn., manufacturer of pipe cutting and threading machines, died Oct. 25. He was 75 years of age.

HARVEY E. EATON, senior member of the H. E. Eaton Co., representative of the Michigan Tool Co. and its affiliates, died Oct. 25.

WILLIAM H. EMERY, president of the Chicago Rawhide Mfg. Co., died Oct. 28 in Syracuse, N. Y., following a short illness. He was 62 years of age.

FRED A. GARBETT, 57, president of the Twin City Machine Co., Minneapolis, Minn., roll grinder manufacturer, died recently.

EDWARD L. GRIMM, 59, president of the Peerless Marine Motor Co., Buffalo, N. Y., died Nov. 3 at Daytona Beach, Fla.

EDWARD D. JOHNSON, former general superintendent of the Wetmore Reamer Co., Chicago tool manufacturer, died recently in that city. He was 56 years of age.

JAMES W. MATHEWS, assistant superintendent of the American Steel & Wire Co., Cleveland, at the time of his retirement in 1929, died in that city Oct. 27.

JOHN HART MCALARNEY, former steel company executive and recently assistant treasurer of the National Foreign Trade Council, died of a heart attack on Nov. 3 in New York City. He was 58 years old.

A graduate of Yale University, Mr. McAlarney was first employed with the Harbison-Walker Refractories Co., Pittsburgh, shorlty afterwards becoming associated with the Carnegie Steel Corp. In 1909 he joined the United States Steel Products Co., remaining with this concern as an executive until 1927. In that year he organized and headed the Tulsa Rolling Mill Co., Tulsa, Okla., in which capacity he continued until 1935, when he became associated with the trade council.

OTTO A. PEGAU, 53, retired vice-president and general manager of the Briggs Mfg. Co., Detroit, died recently in that city.

CHARLES E. ST. CLAIR, works manager of the Sivyer Steel Casting Co., Chicago, died Nov. 5 in Springfield, Ohio. He had suffered a heart attack a few days previously while on a tour of eastern steel foundries.

LOUIS W. STEVENS, 45, works manager of Veeder-Root, Inc., Hartford, Conn., committed suicide Oct. 26. He began with the company 12 years ago as chief draftsman and served as superintendent before his promotion to the position of works manager.

MEETINGS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Southern district meeting, Miami Biltmore Hotel, Miami, Florida, Nov. 28-30. H. V. STREET, Registration Chairman, Florida Power & Light Co., Miami, Fla.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, Engineering Societies Building, New York, N. Y., Dec. 5–9. Society secretary, C. E. Davies, 29 W. 39th St., New York, N. Y.

MOTOR AND EQUIPMENT MANUFACTURERS ASSOCIATION. Annual business meeting, Hotel Blackstone, Chicago, Ill., Dec. 6.

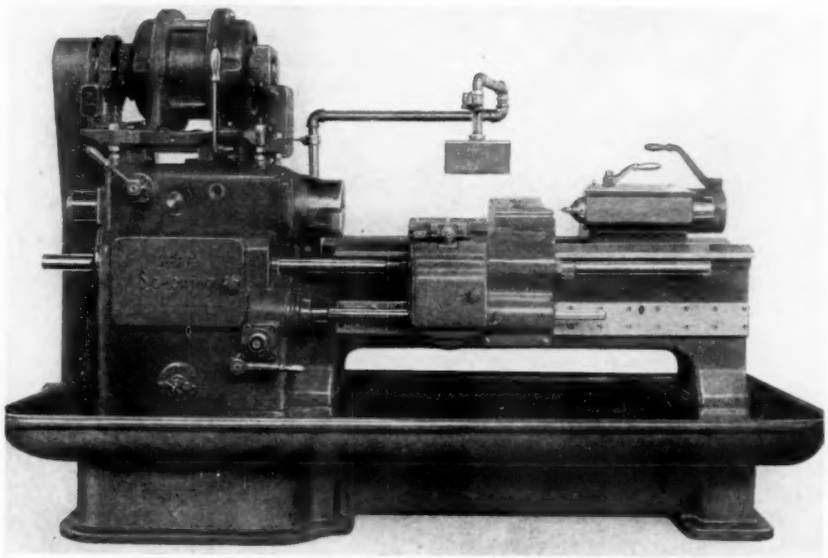
NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting of the Congress of American Industry, New York, N. Y., Dec. 5-9.

NEW ENGLAND GOVERNORS' CONFERENCE. Fourteenth New England Conference, Hotel Statler, Boston, Mass., Nov. 17-18.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual Meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 9-13.

SHOP EQUIPMENT NEWS

Model LR "Lo-Swing" Lathe



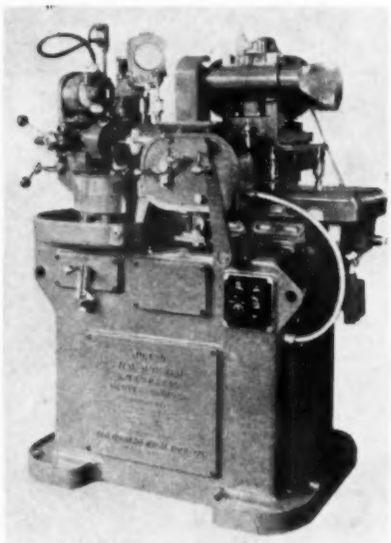
The Seneca Falls Machine Co., Seneca Falls, N. Y. has announced development of the Model LR "Lo-Swing" full automatic cam-operated lathe which embodies a simplified change-over mechanism with which the length of carriage stroke may be varied quickly. This machine has capacity for 5½ in. swing and up to 46 in. between centers in the longest bed length. All rotating shafts are equipped with anti-friction bearings.

The lathe can be equipped either with direct V-belt drive to the spindle for high-speed, fine finishing cuts, or with a geared drive with pickoff gears for slower roughing cuts. It also may be equipped with a third overhead slide as well as additional back squaring attachments, carriages and carriage slides which permit numerous tooling possibilities.

Main carriage support is in direct line with tool pressure, permitting the most efficient use of carbide tipped tools. All tools move directly in toward the work on a straight line, thus reducing necessary front clearance on the tool and providing maximum support for the carbide tip. In the 16 in. bed length, this machine weighs approximately 4,000 lb.

S. & H. "Universal" 48-In. Spring Coiler

Sleeper & Hartley, Inc., 335 Chandler St., Worcester, Mass., has developed the 48-in. No. 1 segment-type universal coiler having a recessed cabinet on the front side from which cam controls are operated. In case of a change, or special spring, both pitch and diameter cams may be shaped, timed and affixed to the cam hub which may be removed from the shaft as a single unit. Individual pressure is provided for each pair of feed rolls and micrometer adjustment is provided for the compound block. This machine will wind coils from music or oil tempered spring wire as large as 0.080 in. in diameter to a maximum of 48 in. feed or wire lengths per spring. It is arranged to take compound gearing for 96-in. feed if this feed is desired for use on 0.041 in. wire or smaller. It can be adjusted for winding springs having an inside diameter of ⅛ to 1 in. and will produce from 16 to 100 springs per minute. Height of wire line above floor is 48 in. Net weight with motor drive is 925 lb.



Van Norman Model 120 Automatic Grinder

Designed particularly for internal grinding raceways of small ball-bearing outer rings up to the No. 204 size, with approximately 1⅞ in. diameter, the Model 120 automatic internal radius grinder offered by the Van Norman Machine Tool Co., 160 Wilbraham Ave., Springfield, Mass., uses a crank drive to provide a positive, smooth movement of the oscillating units. Motorized work-head

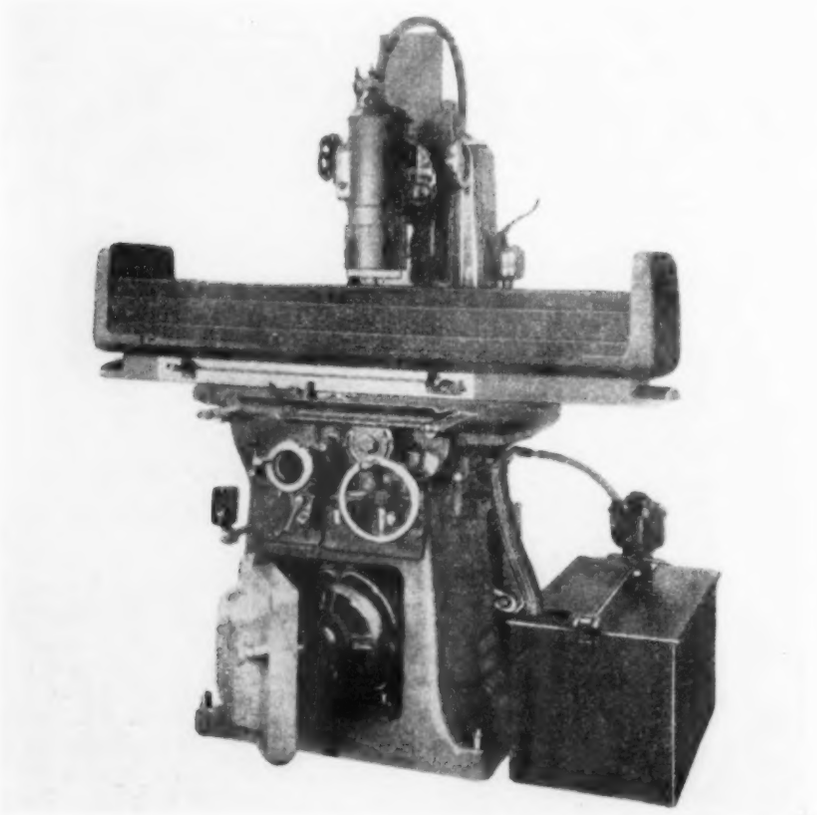
drives the work-head spindle at 2,000 r.p.m. Wheel spindle operates at up to 40,000 r.p.m. and is driven by a 3-hp. motor connected by a belt to a ball-bearing mounted jackshaft. Drive unit is mounted on the wheel slide. This grinder is arranged not only for electric gaging, but also with an electric control on the feed drum so that when the wheel is fed to the proper size the slide automatically will remove to the unloading position.

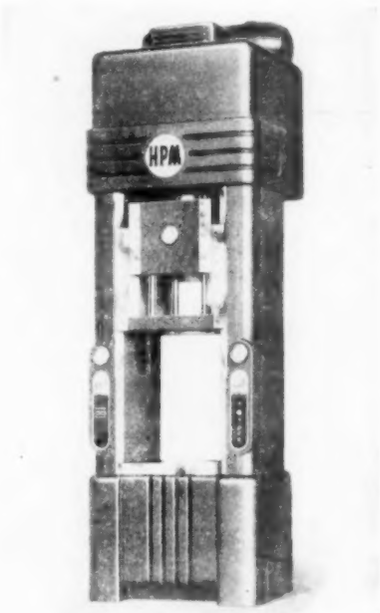
Abrasive No. 34 Vertical Surface Grinder

Heavy spindle of the No. 34 vertical spindle surface grinder offered by Abrasive Machine Tool Co., East Providence, R. I., is driven by hardened and lapped spiral bevel gears, and is mounted in precision ball bearings at both ends. Spindle is carried in a heavy wheel slide which has square vertical ways in which wear is taken up by means of a taper gib. This slide is suspended on a ball thrust bearing and is actuated by means of a worm and worm wheel, elevating screw and bronze nut.

Wheel head is so arranged that it can be tilted or set straight where parts must be ground flat to close limits. Nose of the wheel spindle is arranged to hold Type 2 plain cylinder grinding wheels which now are furnished vulcanized to a thin steel plate. An adapter can be furnished for cupped wheels. Normal spindle speed for the standard 5-in. diameter wheel is 3,050 r.p.m. Table speeds of 20 and 40 ft. per min. are provided, changes being made with a push-pull knob at the front of the transmission case. Table has an automatically-controlled longitudinal movement of 24 in. and a hand-operated transverse movement of 8 in. Vertical adjustment of the spindle, with automatic control, is 12 in. Amount of vertical feed can be adjusted to advance from 0.000125 to 0.0002 in. at each table reversal. The dial can be set to a predetermined depth of cut and automatically will throw out the feed at the desired point, or it can be locked for continuous feeding. The handwheel for fine adjustment of the vertical spindle is provided with a dial graduated to 0.00025 in.

Working surface of table measures 8 x 24 in., and the table has three slots for ½ in. T-bolts. Sandard equipment includes table guards, wheel hood, connections, portable tank and motorized centrifugal pump for wet grinding. The machine has a net weight of approximately 3,000 lb. and requires a floor space of 48 x 100 in.





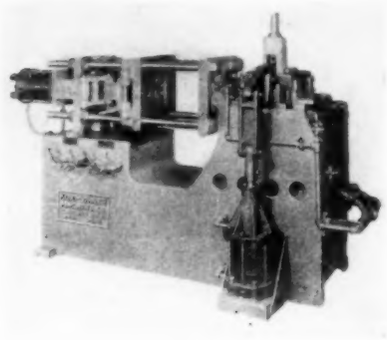
H-P-M "Hydro-Power" "Smooth Line" Presses

The "Smooth Line" series of H-P-M hydro-power "Fastraverse" presses offered by the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, are self-contained units. Each press includes a Model 4R radial pump driven by an electric motor mounted overhead and totally inclosed so as to harmonize with the press styling. All piping and control mechanism is entirely concealed, yet every operating element is conveniently accessible for adjustment and maintenance.

Kux-Lohner Improved Model "B" Die Caster

The improved Model B die casting machine offered by Kux-Lohner Machine Co., 2145–47 Lexington St., Chicago, Ill., is made in two sizes, each arranged so that the casting cannot be made until the dies are closed. Valves are interlocked so that the machine must be operated in proper sequence. The unit shown is pneumatically operated, but these units also are available arranged for hydraulic operation with a self-contained, motor-driven hydraulic pump and built-in accumulator bottle for rapid injection of molten metal into the die.

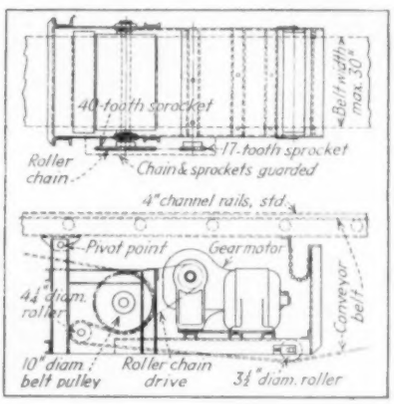
A bridge construction supports the plunger goose neck and no strain



is placed on the furnace and metal pot. An optional core pulling mechanism can be placed anywhere around the dies. Specifications for 18 in. machine: distance between bars, 18½ x 18½ in.; maximum die thickness, 20 in.; die separates, 10½ in.; volume of metal per shot, including gate, up to 10 lb. of zinc; metal pot capacity, 500 lb. of zinc; net weight, 12,000 lb.

Mathews "Wylie" Conveyor Drive

The "Wylie" improved conveyor drive announced by the Mathews Conveyor Co., Ellwood City, Pa., can be located at any point along the length of the belt conveyor, affording considerable flexibility and compactness

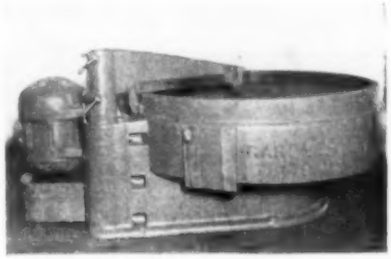


in laying out a conveying system. The design not only permits locating the drive beneath the conveyor, but also within the confines of the conveyer frame, where it is readily accessible for maintenance purposes.

The illustration shows the right-hand end of the drive frame detached from the conveyor frame, being connected only by means of a loose length of chain. This feature provides a positive means of securing maximum effective tension with minimum total belt tension and gives the drive its name: "floating drive." It also eliminates the need for the conventional take-up used in conjunction with head and tail end construction. Two idler pulleys are employed, one to secure maximum belt wrap around the driven pulley and the other to act as a means of securing automatically the correct amount of take-up and belt tension.

Gardner No. 179-72 Horizontal Grinder

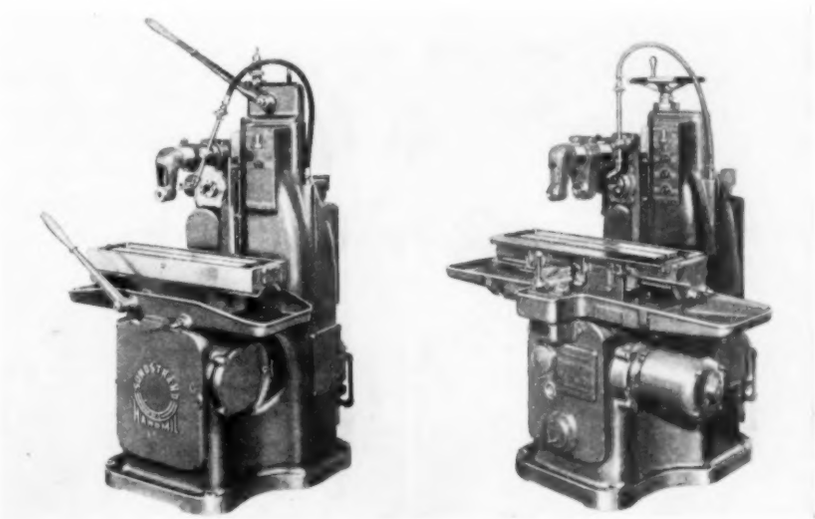
A steel disk wheel 72-in. in diameter is mounted on a substantial supporting flange 40-in. in diameter on the upper end of the main spindle of the No. 179–72 horizontal disk grinder offered by Gardner Machine Co., 410 E. Gardner St., Beloit, Wis. This machine is equipped with a louvre-type removable guard ring and has a swinging bar-type dresser which is pivoted from a 5 in. diameter shaft. When grinding small work this dresser may be left in position at all times. It is quickly swung back out of the way to provide clearance for large parts. A 40 hp. motor normally is used on this machine.



Sundstrand No. 0 Light-Duty "Rigidmil"

Light milling operations on many small parts can be performed economically on the No. 0 Rigidmil with hydraulic or hand feed offered by Sundstrand Machine Tool Co., Harrison and 11th St., Rockford, Ill. Two sizes of the No. 0 hydraulic Rigidmil are available. The smaller size has a 8 x 34 in. working surface on the table and has a maximum table travel of 12 in. The larger machine has a maximum table travel of 18 in. and the working surface of the table measures 8 x 46 in. Pick-off gears are used in the spindle drive of all three machines for spindle drive and gears for speeds within a range of 25 to 1,200 or 50 to 2,400 r.p.m. can be provided. Each ratio provides a total of 61 speed changes. Specifications: distance from floor to top of table, 33¾ in.; distance from top of table to center line of horizontal spindle, 13 in. maximum and 2½ in. minimum; hydraulic feed range, ½ to 38 in. per min.; hydraulic rapid traverse to the table, 325 in. per min.; spindle nose, N.M.T.B.A. standard No. 30; diameter of overarm, 3½ in.; spindle drive motor, 1 hp.; hydraulic pump motor, ¾ hp.

The No. 0 hand-feed Rigidmill has the same integral base-column casting as the machine arranged for hydraulic feed. Working surface of the table on this machine is 8 x 30 in. and it has a maximum table travel of 14 in. This can be obtained with a continuous movement by means of a hand wheel or in adjustable units of 4 in. through a 90 deg. movement of the hand lever shown. Hand feed to spindle head is lever operated in adjustable units of 2 in. within a total distance of 10½ in. In other respects, this machine has the same



features as the hydraulic-feed unit.

A vertical spindle head is available as extra equipment for both the hand-feed and the hydraulic-feed units. This unit can be adjusted for a distance of 0 to 8¾ in. from the top of the table to the face of the spindle and is adjustable between 5⅛ to 6 7/16 in. distance from center line of the vertical spindle to the face of the horizontal head. A No. 1 hydraulic-feed Rigidmill having slightly more capacity than the No. 0 models also has been announced.

Gilman "Four-In-One" Toolroom Machine

The "Four-In-One" toolroom machine offered by Gilman Engineering Works, 214 N. First St., Janesville, Wis., combines the precision lathe, horizontal mill, vertical mill and drill press. The horizontal mill and lathe units are powered by a reversible 1-hp. motor mounted inside the base, while the vertical mill and drilling spindles are operated by a ½-hp. reversible motor equipped with a cone pulley to provide spindle speeds ranging from 390 to 2,200 r.p.m.

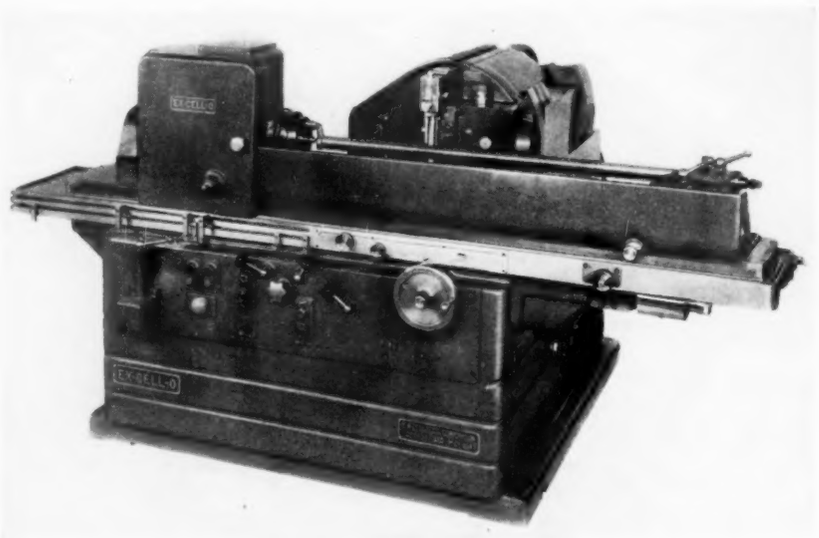
Lathe has a 24-in. bed, a 9-in. swing, and will take 12 in. between centers. Compound rest can be clamped at any position along the bed

and the tailstock is adjustable to take up wear. Horizontal mill has a 4 x 18 in. table with a 10 in. travel. Quill of the vertical mill has a vertical adjustment of 4 in. The drill press is arranged by turning the vertical milling head 90 deg. to the right into position over an 8½-in. diameter table which provides 7½ in. clearance between the end of the spindle and the top of the table. Net weight, 1,000 lb.

Ex-Cell-O No. 35 Universal Thread Grinder

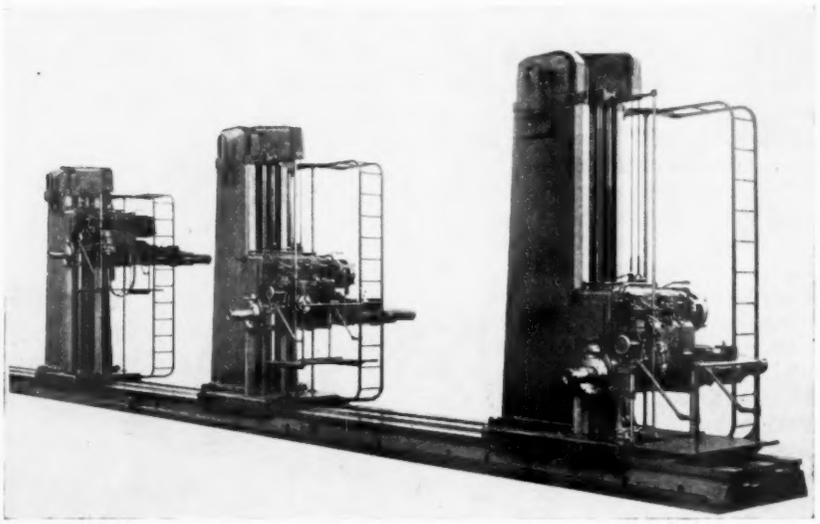
Threads up to 36 in. in length from the work head end on work up to 48 in. between centers can be ground in the improved No. 35 universal thread grinder developed by Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich. Listed as the size 8 x 36 x 48 No. 35 grinder, this model can be provided with a special work table extension and tail stock to grind threads on work up to 60 in. in length.

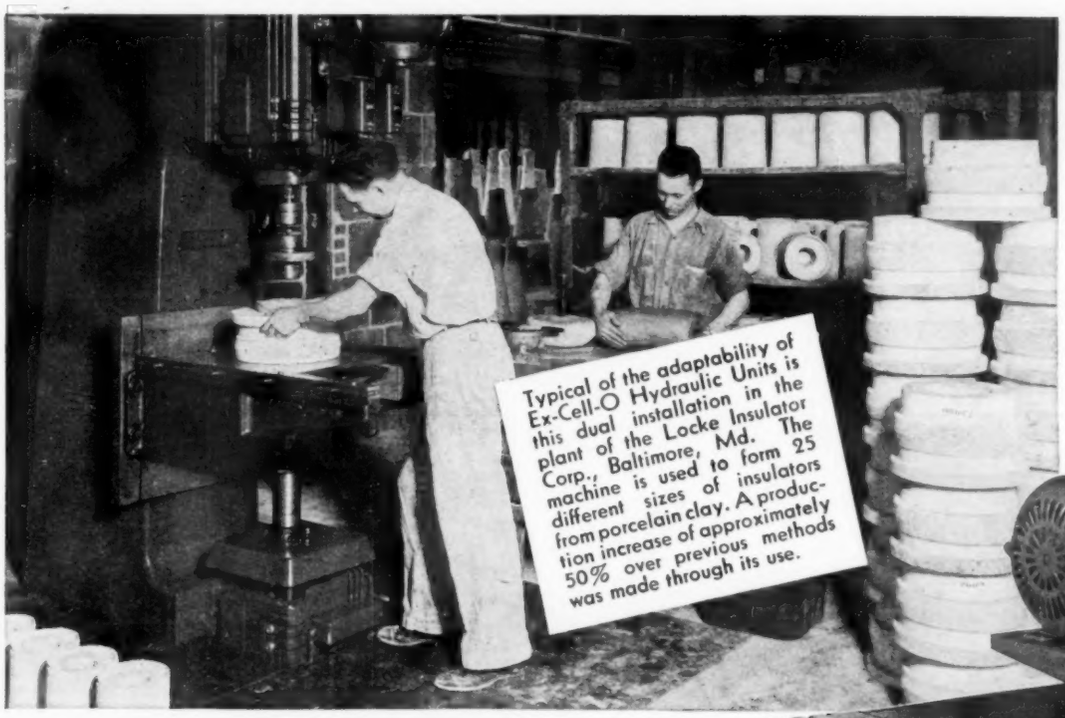
Diameter capacity is 8 in. maximum when using an 18-in. wheel and 12 in. maximum with a 13-in. wheel. Maximum diameter swing is 14¾ in. The machine will grind in both directions and will handle tapers up to 2 in. per ft. Grinding wheels may be trued without slowing down the wheel and the machine may be stopped at the end of each stroke or set to reverse automatically. Lead compensation is provided to insure accuracy of grinding. Wheel speeds ranging from 1,900 to 2,640 r.p.m. are available on this model. A universal wheel dresser is available.



G. & L. Triple-Column Precision Floor-Type Boring, Drilling and Milling Machine

Comprising three independently-operated floor-type precision horizontal boring, drilling and milling units with a headstock travel of 84 in., this triple-column machine developed by Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has a runway 102 ft. long. The maximum distance




Typical of the adaptability of Ex-Cell-O Hydraulic Units is this dual installation in the plant of the Locke Insulator Corp., Baltimore, Md. The machine is used to form 25 different sizes of insulators from porcelain clay. A production increase of approximately 50% over previous methods was made through its use.

FOR DRILLING, REAMING COUNTERSINKING AND SPOT FACING

with SINGLE TOOLS OR MULTIPLE HEADS

If your product requires drilling, reaming, countersinking or spotfacing, an Ex-Cell-O Hydraulic Power Unit can be used to drive and feed a single tool or a multiple spindle head more efficiently.

Mounted on a base with a work-holding fixture, the Unit can be set-up for a wide range of operating cycles. Rapid approach, two feed rates, jump feed, drill, rapid return and stop are controlled by adjustable dogs. With an attachment, jump or step-drilling can also be done. An electric motor on top of the Hydraulic Power Unit drives the hydraulic pump and, thru a train of pick-off gears, also drives the spindle.

Units operate horizontally, vertically or nose down at any angle between. They can be operated by manual or by remote control. Several Units can be mounted on the same base to perform in sequence or simultaneously, and operated by remote control.

You save money by incorporating Ex-Cell-O Hydraulic Power Units in the design of new special machinery, because they out-live the single purpose for which the machine was built. When you make changes in operations or models the Units, being standard, can be re-mounted on new or redesigned machines.

Examples of how these Units are being used, together with complete specifications, will be sent on request.

EX-CELL-O

REG. U.S. PAT. OFF.

DRILL JIG BUSHINGS. GRINDING SPINDLES. HYDRAULIC POWER UNITS. PRECISION BORING AND FACING MACHINES. PRECISION THREAD GRINDERS. COUNTERBORES. BROACHES. CARBIDE TOOL GRINDERS. CARBOLOY TIPPED TOOLS. SPECIAL HIGH PRODUCTION MACHINES. GROUND FORM TOOLS. PRECISION PARTS. MILLING CUTTERS

EX-CELL-O CORPORATION, 1224 Oakman Blvd., Detroit, Mich.
Please send me, without obligation, complete information on Hydraulic Power Units and Special Machinery. (Also, on the products I have checked at the left).

Name ..... Title .....

Company .....

Address .....

from the center of the spindle of the first unit to the center of the spindle of the third unit is 90 ft. Total weight of this equipment is 230,000 lb.; six flat cars were required for the shipment.

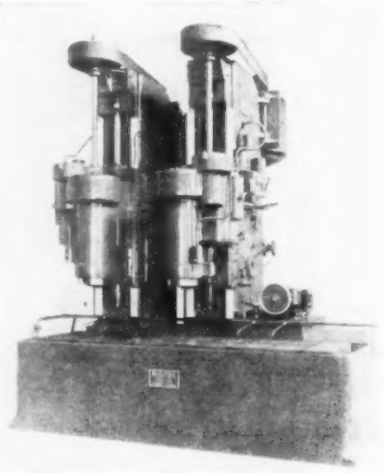
Each machine unit is equipped with a 6-in. diameter main spindle with 48-in. continuous feed and a 2-in. diameter high-speed auxiliary spindle with 9-in. continuous feed. Each main spindle operates at 36 speeds ranging from 6.25 to 375 r.p.m. and the high-speed spindle operates at 36 speeds ranging from 25 to 1,500 r.p.m.

The entire mechanism for speed selection of the spindles, as well as boring, drilling and milling feeds is incorporated in the headstock of each individual unit. The headstock is powered with a dynamically-balanced flange-type 15 hp. motor. Each headstock can be rapid traversed on the column at the rate of 120 in. per min. and each column can be traversed at the same rate.

Moline No. HF-144 Hydraulic Rod Borer

This special No. HF-144 two-column vertical boring machine has been developed by the Moline Tool Co., Moline, Ill., for boring diesel engine connecting rods. The left-hand column is stationary and is bolted to the base. The right-hand column, on the other hand, is movable and is mounted on a large slide which moves on a V-guide and a flat way on the base. Slide is moved by means of a motor-driven worm shaft which actuates a rack and pinion traversing mechanism. Small changes in the column position are made by means of a handwheel.

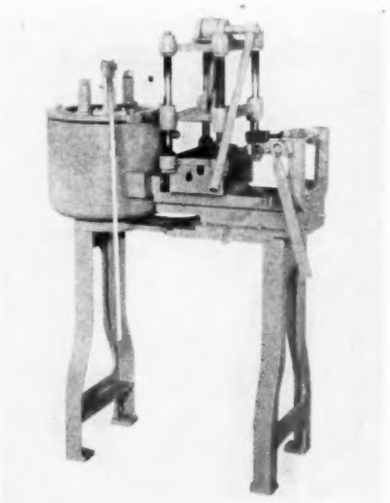
Each of the two spindles is driven by a separate motor, having a 3 to 1 speed range, through V-belts to a spline shaft and a quick-change gear box. Electrically controlled hydraulic feed traverses the spindle on heavy double V-guides. General specifications: spindle speeds, 5.66-238 r.p.m.; spindle center distance, 20-60 in.; feed 0.125-9 in. per min. A coolant tank and pump are provided in the base of the machine. Bores up to 12 in. in diameter can be handled in this machine.



LeBlond Deep-Hole Boring Lathe

An improved deep-hole drilling, boring and reaming lathe has been developed by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Designed not only to meet the government's gun boring requirements, but also for many applications in the industrial field, this lathe can be adjusted to take stock of any length with 5-¼ in. outside diameter and bore a hole of 2½ in. maximum diameter.

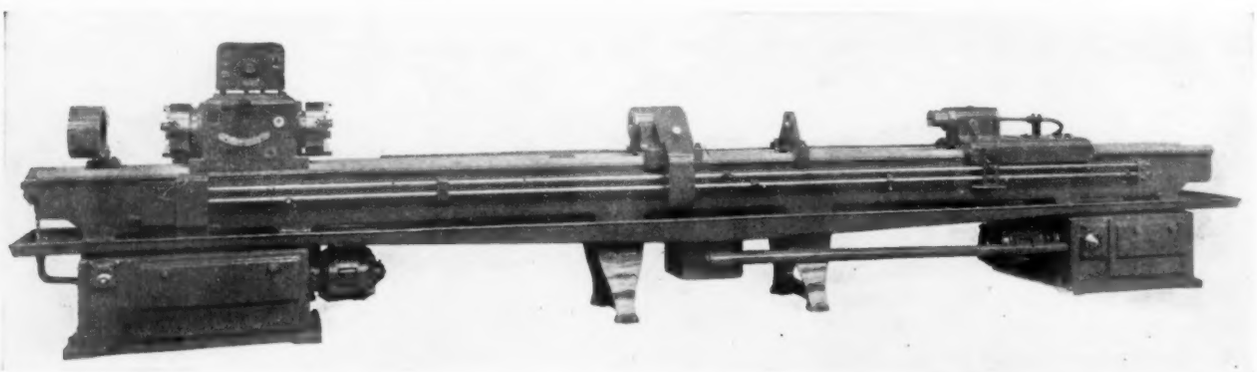
Regardless of resistance variation, the hydraulic feed mechanism is said to provide uniform feeds ranging from 0.0006 in. at 500 r.p.m. up to 0.380 in. at 20 r.p.m. of the spindle. Stops shut off the feed when the carriage reaches the required limit. The headstock provides three mechanical changes of speed through sliding gears; a 20-point rheostat provides a speed range from 20 to 515 r.p.m. for the hollow spindle. A self-contained coolant system, equipped with a motor-driven coolant pump of 15 gal. per min. supplies the cutting tool with a steady stream of filtered coolant at a maximum pressure of 500 lb. per sq. in.

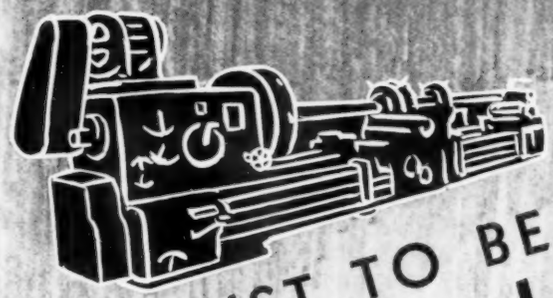


Victor Improved Die Casters

Made in two standard sizes, the improved die casting machines offered by Victor Die Casting Machine Co., 1727 Standard Ave., Glendale, Calif., are available with hand-operated plungers or as air-operated units. The direct air-operated machines have inclosed metal parts. In these units, air admitted to the inclosed pot under pressure forces the metal into the mold. This type is recommended for aluminum alloys and other metals with casting temperatures from 1,000 to 1,250 F.

Die vises on the Senior model will





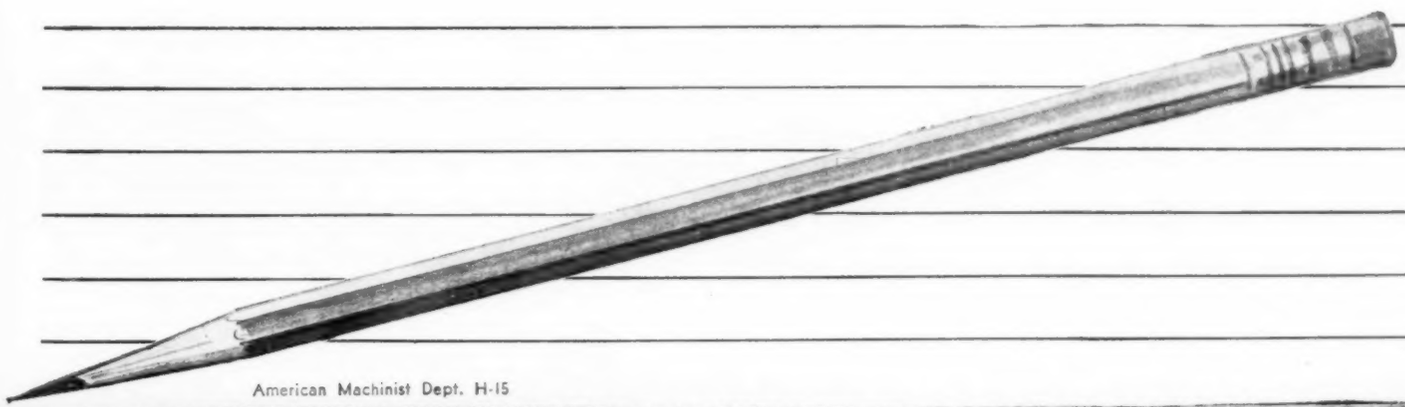
JUST TO BE DIFFERENT we give HALF this page to YOU!

It's the popular custom to show a picture of a tool, glorify its virtues, quote its percentages of savings and hope to heaven that the impression will encourage an inquiry. Just this once we want to be different. We show the picture merely to indentify that LeBlond makes good Lathes. The rest of this space we turn over to you.

You tell us about your problems!—What your present lathe operations are!—What you think you'd like to accomplish in performance, precision, cost reduction! If what we make fits into your picture, we'll tell you how and why...but only at your request. If you like, you can tell us what your experience has told you about LeBlond Lathes. That's up to you. It's your turn now. This is on us. Shoot!

The R. K. LeBlond Machine Tool Co.
CINCINNATI, OHIO

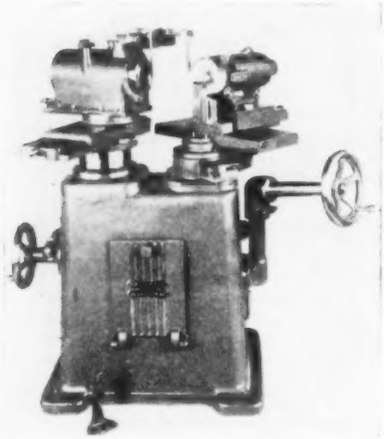
THE SPACE BELOW BOUGHT AND PAID FOR BY LEBLOND FOR YOUR EXCLUSIVE USE



hold dies up to 7 x 13 in., while the vises on the Junior model have capacity for 6 x 10 in. dies. Both models open from 2 to 3 in. between die faces. The Senior machine shown is of the hand-operated plunger type and is equipped with special vertical die vises. Standard machines are equipped with horizontal operating vises.

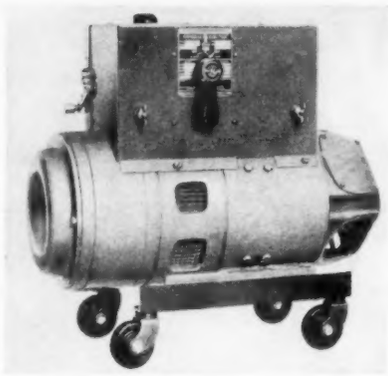
Oliver No. 2 "ARC" Face Mill Grinder

An improved No. 2 "ARC" face mill grinder has been announced by the Oliver Instrument Co., Adrain, Mich. Frame has been made heavier to provide more rigid support for the workhead and grinder head and slides for both heads have been redesigned to reduce set up time in changing from right- to left-hand cutters. This machine has capacity for grinding face mill cutters ranging from 6 to 26 in. in diameter; grinding face, corner and periphery at one stroke of the wheel. Clearance angles for the face can be adjusted according to requirements and any radius from 0 to 2 in. can be ground on the corners of the teeth.



G.E. Single-Operator D.C. Arc Welder

Isothermic overload protection is provided on the 150-amp., d.c. single-operator arc welder developed by the General Electric Co., Schenectady, N. Y., for light-gage work. This unit has a high, instantaneous recovery of voltage which prevents arc pop-outs at all points in its welding range with any good bare, lightly coated, or heavily coated electrode. Any welding current within its range can be obtained by means of a three-point selector switch and a dial for intermediate adjustment. It is rated for use at 25 volts and the range of adjustments varies from 20 to 200 amp.



Elmes Offers Hydraulic Bending Brake

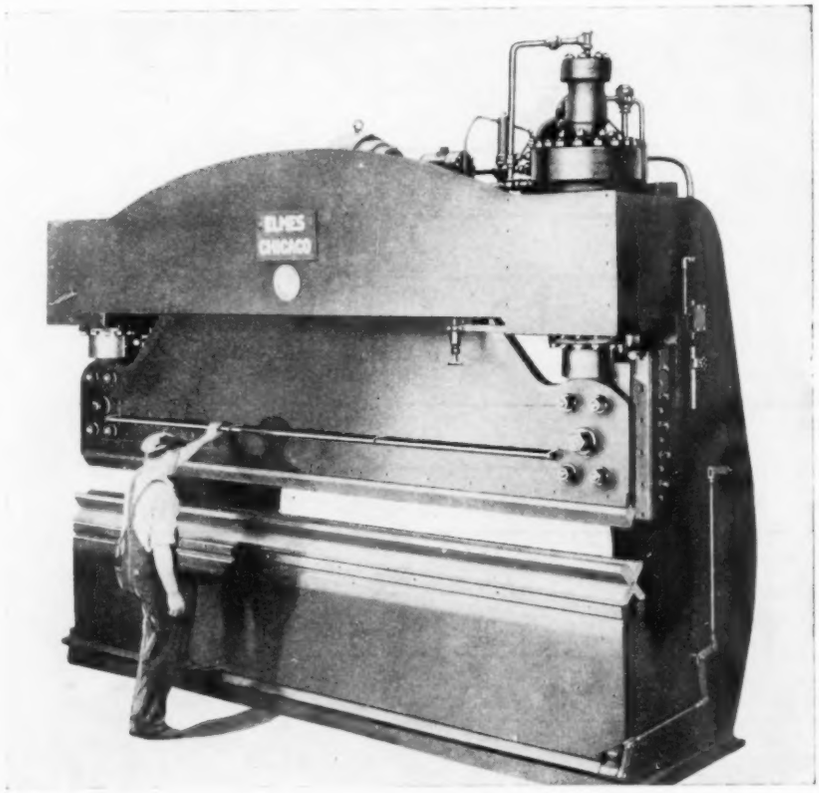
The hydraulic bending brake developed by the Charles F. Elmes Engineering Works, Morgan and Fulton St., Chicago, Ill., is arranged so that travel of the two pistons, which force the bending beam downward is so equalized that it remains constant regardless of eccentric loading. Forming or bending can be done at any point along the bed. It is not necessary to make stroke adjustments for handling varying thicknesses of material, since the bending beam continues on its downward motion as long as the operator depresses the control bar.

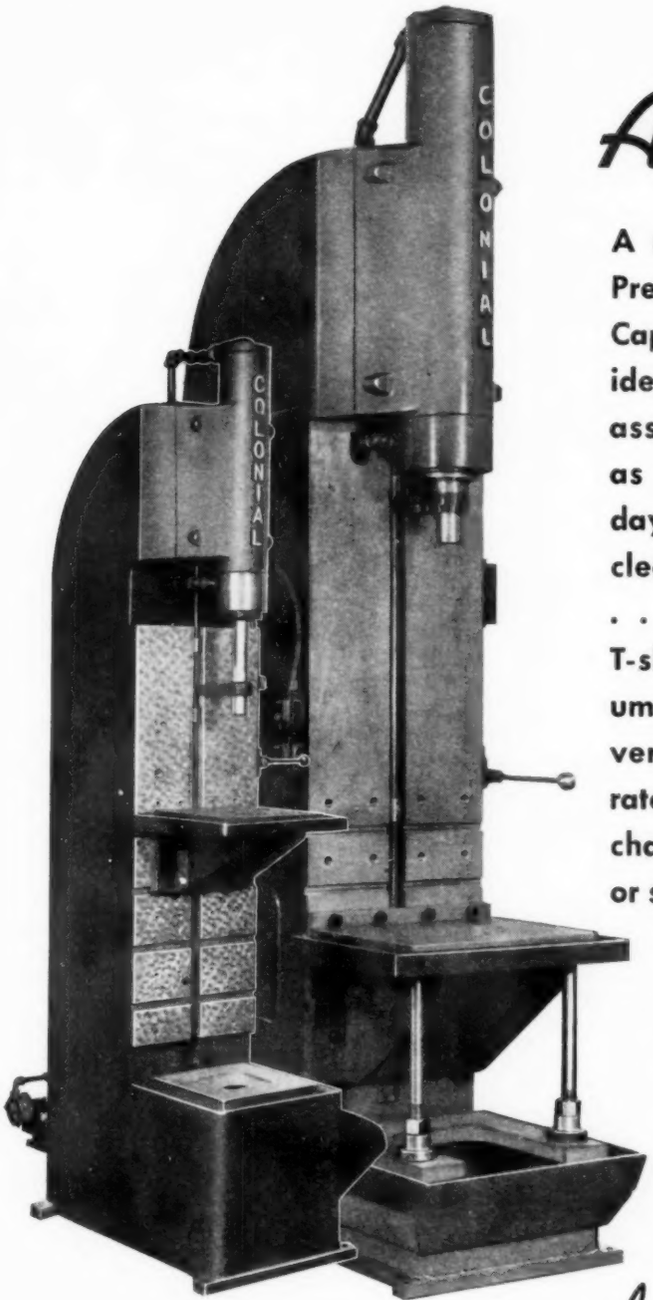
The beam approaches the work at a rapid advance speed, then slows down automatically for the forming operation. Movement of the beam can be stopped and held at any predetermined point. Rapid advance and pressing speeds can be adjusted from zero to maximum easily. Dropping the bending beam when the motor is not in operation is prevented by a safety device, permitting the operator to work safely when changing dies simply by stopping the motor. Standard dies can be used.

Williams Bantam "Supersockets"

Three lines of "Bantam" sockets have been added to the "Supersocket" wrench line by J. H. Williams & Co., 75 Spring St., New York, N. Y. These sockets are designed for use with ratchets and other handles fitted with $\frac{3}{8}$ in. square drive and have thin

walls for operation in close and awkward places. The new lines include extra deep 12-point sockets in six





Announcing

A new line of Utility Broaching Presses with OPEN SIDES . . . Capacity from 2 to 15 tons . . . ideally adapted to broaching and assembly work on long as well as short pieces . . . Maximum daylight . . . up to 60-inch stroke clearance on standard machines . . . Maximum flexibility . . . T-slots and tapped holes on column permit adjustment of table vertically in 6-inch steps . . . Separate cylinder casting permits rapid changeover to increase capacity or stroke . . . Six standard models.

Illustrated: 2-ton and 10-ton models
Capacities: 2, 4, 6, 10, 12 and 15 tons
Stroke: 18-inch on 2 and 4 ton
36-inch on 10 to 15 ton
Stroke adjustable with column stops.

Variable power stroke speed at slight extra cost.

Separate coolant pump with all models.

Special tonnages and strokes available.

Vertical motor mounting in column optional.

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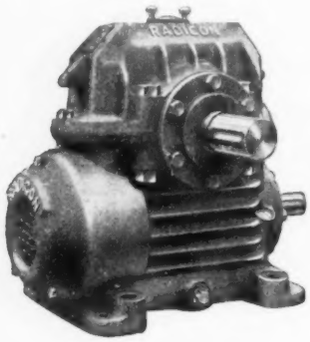
COLONIAL BROACH CO.
147 Jos. Campau—Detroit

open side
UTILITY
BROACHING
PRESSES
by Colonial

sizes with openings from $\frac{7}{16}$ to $\frac{3}{4}$ in.; extra deep 8-point sockets in four sizes with openings from $\frac{7}{16}$ to $\frac{5}{8}$ in. and universal 12-point sockets in four sizes with openings from $\frac{7}{16}$ to $\frac{5}{8}$ in; The universal sockets are fitted with spring tension to maintain the desired angle when applying the socket to the job.

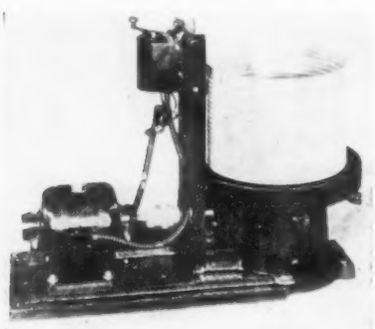


"Radicon" Reducers Offered by Prosser

Thomas Prosser & Son, 120 Wall St., New York, N. Y., have been appointed exclusive distributors for the United States of the "Radicon" worm speed reducers developed by David Brown & Sons, Huddersfield, England. Automatic oil circulation in these units is claimed to reduce maintenance costs. The patented shape of the gear tooth, in conjunction with the special cooling method, is claimed to insure higher powers with normal temperature rise.

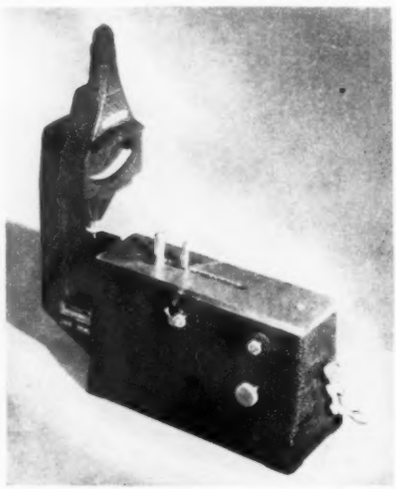
Improved "Mercil" Centrifugal Dryer

A batch of 30–60 lb. of small plated work can be dried in one or two minutes with this combination of the "Mercil" dryer and electric drying unit developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This improved unit includes a "Garden City" blower direct connected to a $\frac{1}{4}$ hp. motor. A 6-in. pipe line is welded to the cover and extends over to the blower to a point where it can swing out in a horizontal position.



Precision Model N-2 Internal Gage

The Model N-2 universal internal measuring machine developed by the Sheffield Gage Corp., Dayton, Ohio, provides an infinite range in the measurement of any size internal diameter from $\frac{5}{8}$ to 6 in. against a master or precision gage block setting. In this instrument two fingers, each carrying a measuring point and both adjacent to a vertically traveling work-rest plate, are arranged so as to permit full exploration and determination of the dimensions of the hole within the $1\frac{1}{2}$ in. depth range of the gage. The so-called fixed gaging point floats on reeds with a fixed relation to the reed pivot which transfers the motion of the adjustable gaging point to the visual gage.



G. E. Gage Measures Thickness of Coatings

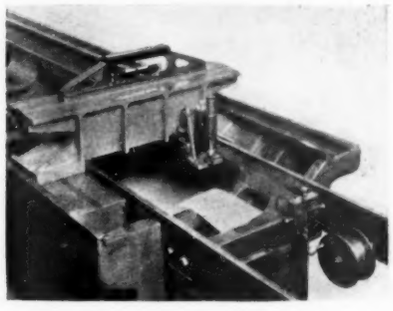
Accurate measurement of the thickness of non-magnetic coatings on iron or steel is possible with the improved thickness gage announced by General Electric Co., Schenectady, N. Y. This gage uses a spool-like steel head whose two flanges both make contacts and assure accurate measurement on curved as well as on plane surfaces. Individual readings of the two contacts are averaged automatically.

This gage can measure with reasonable accuracy the thickness of a non-magnetic coating as thin as 0.0001 in., if the coating has been applied to a steel sheet, 0.007 in. or more thick.

With coating thicknesses of 0.005 or more, the unit is accurate to 2 per cent. If it is desired to measure the thickness of such materials as paper and celluloid, sheets can be fitted to an iron or steel plate for accurate readings.

Norton "Microliner" Aligns Grinder Beds

Designed for aligning the beds of long cylindrical grinders, the "Microliner" offered by Norton Co., Worcester, Mass., consists chiefly of a bridge of cast iron planed and scraped to correspond with the flat and V base ways of Norton Grinders, a microscope mounted on the bridge, a coil of music wire and clamps for holding the wire in position. The microscope has an accurate scale graduated in thousands of an inch across the optical field, which is illuminated by a dry cell operated lamp built into the instrument. This unit is used in the construction of Norton Grinders so that the ways may be scraped perfectly straight and is equally useful to customers when setting up machines on foundations.



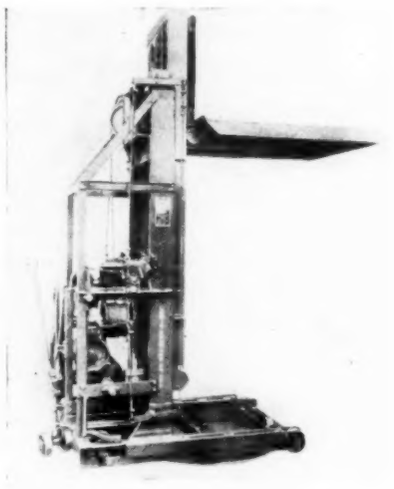
"Comet" Portable Electric Hoist

The Chisholm-Moore Hoist Corp., Tonawanda, N. Y., has developed the portable, plug-in "Comet" electric hoist in capacities of 250, 500, 750 and 1,000 lb. for use on lighter material-lifting operations. This hoist is powered with a heavy-duty, high-torque motor than can be plugged in on an ordinary lighting circuit. Con-

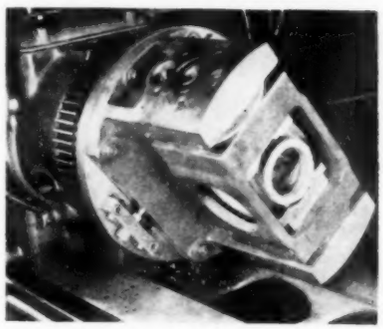
troller incorporates a "delayed reversing" feature and can be operated with one hand. The control is sufficiently sensitive for lifting the load fractions of an inch.

L.-S. No. PBRT-1923 Revolving Stacker

The Lewis-Shepard Sales Corp., 117 Walnut St., Watertown, Boston, Mass., offers the No. PBRT-1923 portable stacker equipped with a retractable revolving base. This telescopic-type elevator may be moved along the floor with its regular travel wheels to any given position. These



wheels then are retracted to allow the weight of the stacker to be transferred to the circular plate which supports four rotating wheels mounted in stationary positions in the base. The stacker will lift a load of 1,500 lb. and the platform may be positioned from 8½ to 133 in. above the floor as may be required.

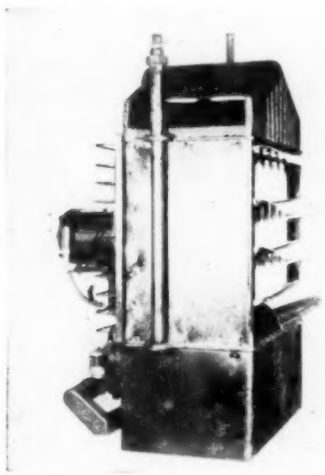


Gisholt 7-Position Indexing Fixture

Gisholt Machine Co., Madison, Wis., has developed a seven-position indexing fixture for machining different size gate valves and pipe fittings. This fixture may be used on Gisholt No. 3AL, 4L or 5L heavy-duty turret lathes. It locates and holds the work to be machined and permits complete machining with one setting. The seven positions provided for are 0, 45, 90, 180 and 270 deg. and two positions of approximately 3 deg. off center. Capacity is for holding 2 to 5 in. valve and pipe fittings.

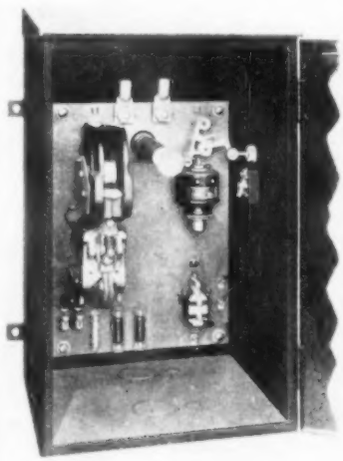
"Pittsburgh" Series U Gas-Fired Heater

The Automatic Gas Steam Radiator Co., 403 Brushton Ave., Pittsburgh, Pa., offers the Series U gas-fired unit heater in five sizes, ranging from 85,000 to 200,000 B.t.u. per hr. This heater is constructed so that the gas fired into a combusion chamber and the products of combustion are passed upward through a bank of tubes and out at the rear of the housing. Air is passed around the tubes by means of a motor-driven fan located on the back of the unit.



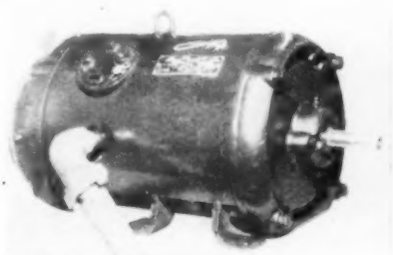
EC&M "Line-Arc" Sectionalizer

Offered for the protection of d.c. power circuits, the "Line-Arc" repeating sectionalizer developed by The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio, consists of a magnetic contactor, and overload relay equipped with a ratchet lock-out feature, and a timing circuit to provide time delay after the overload relay has tripped and opened the contactor because of an overload, ground or short circuit. The inclosing cabinet is of drip-proof design and can be furnished in gasketed, dust-tight, water-tight, or other forms.



L.A. Explosion-Proof D.C. Type ENA Motors

Type ENA explosion-proof D.C. motors, announced by Louis Allis Co., 133 E. Stewart St., Milwaukee, Wis.,



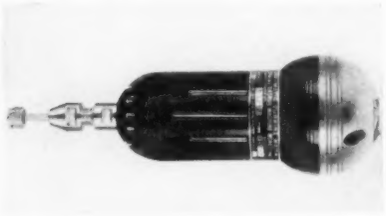
are interchangeable with A.C. and D.C. NEMA frame sizes with reference to dimensions *D* and shaft sizes. They are available in a wide range of electrical and mechanical modifications. These motors have been inspected and rated as acceptable by the Bureau of Mines Laboratory and by

the Underwriters Laboratories.

Precision ball bearings support the rotor of this motor, the bearing races being locked in position by heavy end caps. Ventilating fan is cast from a non-sparking high tensile aluminum alloy and is mounted on the commutator end of the motor.

Onsrud No. B-1 Turbine 75,000-R.P.M. Grinder

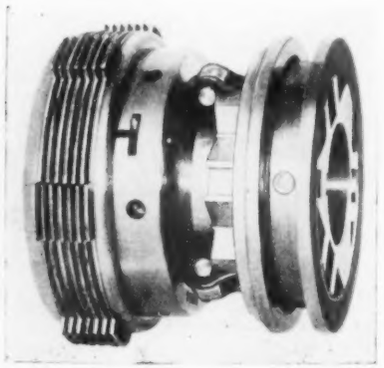
Designed for continuous duty at 75,000 r.p.m., the Model B-1 pneumatic turbine grinder announced by Onsrud Machine Co., Inc., 3910 Palmer St., Chicago, Ill., has a rating of 1/6 hp. It is designed especially for tool and die grinding and for use as a marking



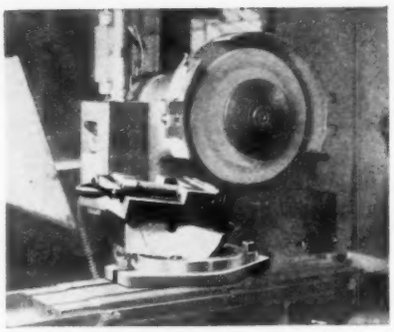
tool for writing in all types of metals, plastics, glass, porcelain and other materials. It is said to operate with equal efficiency in any position and may be mounted on a lathe tool post holder for internal grinding or placed in a vise for tool resharpening.

"Twin Disc" Model MT Multiple Disc Clutch

Designed for machine tool and other installations where space is limited, the Model MT multiple disc clutch announced by Twin Disc Clutch Co., Racine, Wis., is available in nine different sizes, ranging from 3 to 8 in. in diameter. They are available in



single or duplex units and arranged to run dry or in oil. Adjustments can be made on all sizes from a single point to give maximum capacity from minimum lever pressure.



Wesson No. 2 Universal Vise

Made entirely of steel, the No. 2 universal vise offered by Wesson Co., 1050 Mt. Elliott Ave., Detroit, Mich., will swing a full 90 deg. in top and side planes and a full 360 deg. in the bottom plane. Jaws are of hardened tool steel. Over-all height of this vise when set level is $4\frac{3}{8}$ in. and maximum opening is $1\frac{5}{16}$ in. Jaw width is 3 in.; weight, 9 lb. The companion No. 1 vise has been redesigned and lowered 4 in. This vise weighs 46 lb., is $6\frac{1}{8}$ in. high and opens 4 in.

F-M Explosion-Proof Type QZX Motors

The Type QZX line of explosion-proof, ball-bearing motors offered by Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill., are built in NEMA frames and can be applied in the same manner as any standard open motor. Double-end ventilation assures positive cooling and is claimed to eliminate hot spots. These motors have been approved by the Underwriter's Laboratories for Class 1 Group D hazardous locations.

"Dag" Graphites In Several Grades

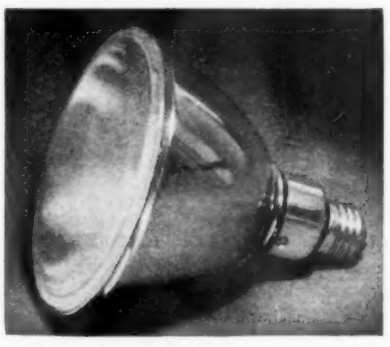
An improved process developed by Acheson Colloids Corp., Port Huron, Mich., permits the commercial production of graphite products having considerably smaller particle size and correspondingly improved suspension. Instead of a single grade as heretofore, "Dag" colloidal graphite will be marketed in several grades distinguished primarily by a range of particle size. These graphites also are available in a wider range of vehicles.

Ideal Marker For All Materials

Using a hardened steel point, the "Ideal" electric marker offered by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., will mark steel, bronze, brass, alloys, marble, tile, glass, porcelain, plastics, wood, hard-rubber, bakelite, ceramics and similar materials. The hammer provides 7,200 cutting strokes per minute. For engraving extra hard materials, a diamond point is available.

Westinghouse Lamp Has Reflector in Bulb

A parabolic reflector, precisely positioned in relation to the filament, is included inside the bulb of two Mazda lamps announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These light sources are made with a flared bulb which is coated on the inside with a highly polished metal reflector, and are rated at 150 watts. They are available for 110, 115 and 120 volt circuits. Rated life is 1,000 hr.



Frost "No-Rust" Liquid No. V-15

Recommended for protecting polished steel surfaces of machinery and tools against rust in storage and during shipment, "No-Rust Liquid V-15" offered by Frost Paint & Oil Corp., 1209 Northeast Tyler, Minneapolis, Minn., can be applied with a brush or spray gun. It requires no mixing or special preparation. It dries in 30 min. to form a tough, elastic, nonporous film which resists abrasion, moisture and salt air. The coating can be removed by wiping with gasoline or kerosene when the machine is placed in service.

Lincoln "Softweld" Welds Cast Iron

Designed for deposited a soft machinable alloy on cast iron, the "Softweld" heavily coated shielded arc electrodes offered by the Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio, operate best with d.c. negative polarity, although a.c. may be used. While a single layer deposit will be machinable in the weld metal, at least two layers should be deposited in order to obtain a soft fusion zone. The entire weld area may then be machined, sawed, drilled and tapped without difficulty. It is available in 16 in. lengths $\frac{5}{32}$ in. in diameter.

Formica "Pregwood" Laminated Sheets

"Pregwood" is a product consisting of thin laminations of wood impregnated with phenolic resins and vulcanized into a hard homogeneous sheet offered for various mechanical and electrical purposes by The Formica Insulation Co., Cincinnati, Ohio. It is claimed to show a minimum of dimensional change due to moisture. The material is offered in sheets $\frac{1}{4}$ in. or thicker, measuring 20 x 96 in. It also can be furnished in rods cut from sheets, but not as tubing. "Pregwood" has a specific gravity of 1.35 and a flexural strength of 25–30,000 lb. per sq. in.

"Oman" Bearing Metal Is Self Lubricating

The Oman Metals Co., 1750 W. Carroll Ave., Chicago, Ill., offer "Oman" self-lubricating metal for making bushings, bearings, slides, gibs and similar parts. This material is a copper matte having its interstices filled with amorphous virgin lead. The latter serves as a lubricant, while the copper acts as a conductor to carry away the heat from the bearing and to support the lead. By proportioning the lead and the copper, various grades of this metal are obtained, each being best adapted for specific purposes.

du Pont High-Speed Copper Plating Process

An improved high-speed process for plating copper, claimed to be four times as fast as the ordinary cyanide processes, has been announced by the Electroplating Chemicals Div., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Differing radically in operation and results from any of the standard accepted practices, this process achieves its speed because of 100 per cent cathode efficiency using high cathode current density. Heavy coatings ranging from 0.001 to 0.003 in. can be obtained in from 10 to 20 min., leaving good surfaces for direct depositions of bright or dull nickel. High-purity copper anodes are required.

Inland Created Ledloy

to Save Machining Costs

—and Here Are Some Typical Results

An Automotive Parts Maker

"Using Inland Cold Finished Ledloy, we were able to reduce our machining time on automatic parts from 11 seconds to 3½ seconds. The machine finish obtained with Inland Ledloy is excellent."

Household Utilities Manufacturer

"We are now using Inland Cold Finished Ledloy for a part formerly made of SAE X-1315. It has increased our rate of production 45%. Results from heat-treatment are also completely satisfactory."

Conveyor Equipment Manufacturer

"We are using Inland Cold Finished Ledloy 1115 on a screw machine job that is threaded the entire length of the bar. Formerly we used SAE X1112 for this part. Inland Ledloy is saving us $12.50 per ton in direct labor cost alone. We could not afford to pass up this attractive economy."

Ledloy has the same characteristics as any other open hearth steel except for its greatly increased machinability. Order cold finished Ledloy from leading cold drawing concerns and hot rolled forms from Inland.

INLAND STEEL CO.

38 South Dearborn Street, Chicago

Sheets Strip Tin Plate Bars Plates Reinforcing Bars Floor Plates Structurals Piling Rails Track Accessories

TRADE PUBLICATIONS

ALLOY CASTINGS "Amsco" heat and corrosion resistant castings are described in a 24-page illustrated booklet released by the American Manganese Steel Div. of the American Brake Shoe & Foundry Co., 389 East 14th St., Chicago Heights, Ill.

BEARINGS Catalog No. 39, published by the Bunting Brass & Bronze Co., Toledo, Ohio, contains 52 pages of data on standard bearings and bearing materials.

BORING TOOLS Davis Boring Tool Div., Larkin Packer Co., 6200 Maple Ave., St. Louis Mo., describes a line of special boring tools in Bulletin No. 200.

BROACH Bulletin No. 5, offered by the East Shore Machine Products Co., 833–839 E. 140 St., Cleveland, Ohio, describes a set of "Glenny" adjustable expansion broaches.

CAST IRON The International Nickel Co., 67 Wall St., New York, N. Y., has issued a revised edition of Nickel Cast Iron Data Sheet Section 1, No. 1.

CENTERLESS GRINDING Circular No. G-422, describing tungsten carbide work support blades, for Nos. 2, 3 and 4 centerless grinding machines, can be obtained from Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio.

CHAINS Catalog No. 333, released by the Chain Belt Co., Milwaukee, Wis., contains 128 pages of illustrations and data concerning the "Rex" line of roller chains and sprockets.

CLAD STEEL The International Nickel Co., 67 Wall St., New York, N. Y., has issued a revised edition of Bulletin No. T-4, which discusses methods for the fabrication of nickel-clad steel plate.

CLEANING EQUIPMENT A line of machines for washing parts prior to final finishing is described in a folder released by G. F. Blakeslee & Co., Cicero Station, Chicago, Ill.

COLLET Features of the "Martin" master collet are described in a leaflet now being distributed by the Modern Collet & Machine Co., 401 Salliotte St., Ecorse, Mich.

COMPRESSOR DRIVE Bulletin No. H-850-B55, released by the Worthington Pump & Machinery Corp., Harrison, N. J., describes a power take-off drive for use with small air compressors mounted on trucks.

DIE BLOCK The "FX Special" die block is described in a folder released by A. Finkl & Sons Co., 2011 Southport Ave., Chicago, Ill.

DISK GRINDING Various types of disk and plate-mounted cylinders for production grinding are described in Booklet No. 1141-2, now being distributed by the Norton Co., Worcester, Mass.

DRILL POINTER The Oliver Instrument Co., Adrian, Mich., has published an 8-page illustrated folder describing the new Model 510 drill pointer.

ELECTRIC FURNACE A mailing folder now being distributed by the Ajax Electrothermic Corp., Ajax Park, Trenton, N. J., discusses Ajex-Northrup electric melting furnaces.

ENGINE The Ingersoll-Rand Co., 11 Broadway, New York, N. Y., has released Catalog No. 10110, which describes the Type S diesel engine.

FILES A line of rotary files and rasps is described in a folder now being distributed by the R. G. Haskins Co., 2760 West Flournoy, Chicago, Ill.

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GRINDING WHEEL LIFE
INVESTIGATE
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FLOORING The use of "Ruggedwear" resurfacer for repairing concrete floors is discussed in Folder No. RW-L-839, released by the Flexrock Co., 800 N. Delaware Ave., Philadelphia, Pa.

FORGINGS A line of forged products is discussed in an illustrated booklet released by the Heppenstall Co., Pittsburgh, Pa.

GRAPHITE The Acheson Colloids Corp., Port Huron, Mich., discusses graphoid surfaces in Bulletin No. 220.4. Folder No. 626, also available, covers the treatment of screw threads with colloidal graphite.

GRINDER A folder now being distributed by the Abrasive Machine Tool Co., East Providence, R. I., describes the No. 34 vertical-spindle surface grinding machine.

GRINDER The Landis Tool Co., Waynesboro, Pa., describes the new No. 2 "Race-A-Way" grinder in Catalog No. RW-38.

HEATER Bulletin No. 3137, released by the Buffalo Forge Co., 448 Broadway, Buffalo, N. Y., describes the Model C "Breezo-Fin" unit heater.

INSTRUMENTS Booklet No. 1325, issued by the Esterline-Angus Co., Indianapolis, Ind., discusses the savings possible from the installation of various types of recording instruments.

MAGNETIC BRAKES Folder No. 112, issued by the Stearns Magnetic Mfg. Co., Milwaukee, Wis., describes a line of magnetic clutches, brakes and clutch-brake combinations.

MATERIALS HANDLING The Chain Belt Co., 1600 W. Bruce St., Milwaukee, Wis., has published Bulletin No. 332, describing several types of conveyor systems for handling bulk materials.

NICKEL ALLOY The International Nickel Co., 67 Wall St., New York, N. Y., has issued a revised edition of Bulletin No. T-7, which contains technical information concerning the properties and uses of "Inconel."

POWER TRANSMISSION The Palmer-Bee Co., Detroit, has issued a 48-page illustrated folder describing a line of power transmission and materials-handling machinery, and fabricated steel.

PYROMETER Leaflet No. B-1138, issued by the Thwing-Albert Instrument Co., 3339 Lancaster Ave., Philadelphia, Pa., describes wall-type and portable radiation pyrometers.

PRICE POLICIES A pamphlet entitled "Industrial Price Policies" and based on a study recently completed by the Brookings Institution, has been published by the Public Affairs Committee, Inc., 8 W. 40th St., New York, N. Y. Price, 10 cents per copy.

RELAY CASES Catalog Section No. 41-070, released by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., gives specifications for a line of standard rectangular relay cases.

ROLL GRINDING Booklet No. 16-45-1, published by the Norton Co., Worcester, Mass., discusses the technique of roll grinding and includes wheel recommendations for various types of work.

"ROTO SHAVING" The National Broach & Machine Co., Sheomaker & St. Jean Sts., Detroit, Mich., has published an illustrated folder describing the "Roto Shaving" process.

SAFETY A catalog describing a line of protective clothing has been made available by the American Optical Co., Southbridge, Mass.

STEEL Scully Steel Products Co., 1319 Wabansia Ave., Chicago, Ill., has published a 244-page stock list and reference book.

STANDARDS A 110-page bulletin entitled "Trade Standards of the

gratifying also in exacting service

T-J AIR CYLINDERS

function always to your advantage. You demand a unit to exert the right amount of power at the right speed. In addition to this, you require that this power be applied repeatedly, without failures in timing and without time out for replacements or adjustments. You require a cylinder designed and built to successfully withstand fatigue, one that incorporates the use of packings that require no adjustment, one whose design throughout is controlled by features which count for service, one that takes the toughest jobs in its stride. These "service" features of T-J Air Cylinders are described in our catalog No. 36. It will help you too in selecting the type of equipment best suited to your installation.

THE TOMKINS-JOHNSON CO.
615 N. Mechanic Street, Jackson, Michigan

Agents in Principal Cities

Compressed Air Institute" has been made available. Copies may be obtained for $1.00 each from the organization headquarters at 90 West St., New York, N. Y.

STEEL PIPE Pamphlet No. Adv. 316, issued by the Republic Steel Corp., Cleveland, Ohio, contains specifications of standard steel pipe, copper-bearing steel pipe and "Toncan" copper-molybdenum iron pipe.

STEELS The 1937-1938 catalog of A. Finkl & Sons Co., 2011 Southport Ave., Chicago, Ill., includes specifications of various tool and die steels, as well as tables and other data of value to tool and die makers.

TAPS A 28-page illustrated folder, released by the Winter Bros. Co., Wrentham, Mass., describes a line of taps and includes several tables of value to machinists.

THREAD-GRINDING The principles involved in grinding threads are discussed in Booklet No. 1487, published by the Norton Co., Worcester, Mass.

TOOLS The Morey Machinery Co., 410 Broome St., New York, N. Y., has published a 64-page inventory catalog listing the equipment of the Pierce-Arrow Motor Corp., which the Morey organization is liquidating.

TRADE SHOWS The fourth annual edition of "Industrial and Trade Shows Schedule" has been made available by the Exhibitors Advisory Council, Inc., 122 E. 42nd St., New York, N. Y. Copies may be obtained from the Council for $4 each.

TURRET LATHES An illustrated folder now being distributed by the Gisholt Machine Co., 1201 East Washington Ave., Madison, Wis., describes typical turret lathe installations.

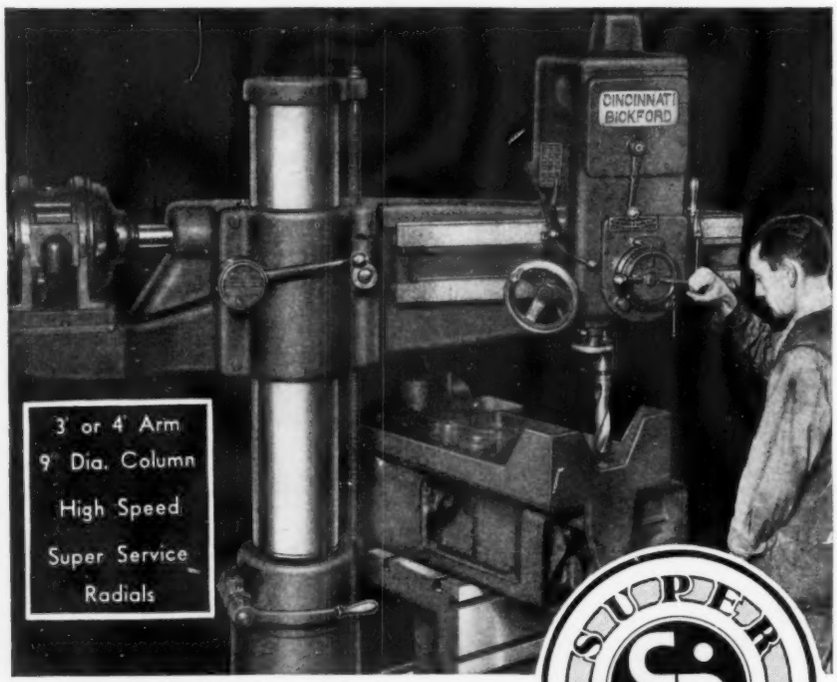
VOCATIONAL SCHOOL The 56-page bulletin of the St. Paul Vocational School, 14th and Jackson St., St. Paul Minn., contains details of the school's objectives and methods, together with the curriculum offered for learning the machinist trade.

WELDER Data Sheet No. 26–140, issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes the Model SFA engine-driven welder.

WELDING A pamphlet issued by the Mahoning Paint & Oil Co., Youngstown, Ohio, describes the use of "Spatter-Nox" to eliminate adhesion of arc welding spatter.

WELDING "Flexarc" welding accessories and supplies are described in Catalog Section No. 26-620, released by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FINGER TIPS CONTROL THIS *High Speed* RADIAL



SUPER SERVICE C B

For interchangeable manufacture and the full efficiency of rapid production jigs, you need the convenience and finger-tip ease of handling which the High Speed Super Service Radial provides.

The standard motor being mounted at the rear of the arm promotes balanced finger-tip control of the arm swing. The head is thus kept light and being mounted on anti-friction bearings, rolling on a hardened steel armway, makes for easy quick traverse along the arm and with a minimum of wear.

Bulletin R-21A describes in detail the high production features of this time-saving, money-saving machine. Write for your copy today.

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OAKLEY, CINCINNATI, OHIO, U. S. A.

SUPER-SERVICE RADIALS

NEW BOOKS

ENGINEERING TERMINOLOGY. — *By Victor J. Brown, publishing director, Roads and Streets, and Delmar G. Runner, assistant materials engineer, U. S. Bureau of Public Roads. First edition,* 310 *pages,* 6 x 9 *in. Cloth-board binding. Indexed and illustrated. Published by Gillette Publishing Co.,* 330 *S. Wells St., Chicago, Ill. Price,* $3.50.

Many occasions have arisen in which one has been at a loss to know definitely the meaning of a technical word or phrase. A word in one branch of engineering may not have the same meaning as when used in some other branch. It is to avoid such a condition that this book has been prepared. Included are engineering abbreviations, German-English words, Spanish-English and English-Spanish words, temperature inter-conversion factors, symbols for hydraulics, abbreviations of engineering terms, symbols

for mechanics and hydraulics, conversion factors, chemical elements with their atomic numbers, symbols, melting points, standard pump classifications, and material on the pumping of various liquids. Each of the words and phrases and the appendix material have been approved by a committee of the technical society or trade association of the branch of engineering from which the word was taken or to which it applies.

•

APPLIED TIME AND MOTION STUDY—*By Walter G. Holmes, time study engineer, Detroit Timken Axle Company. 335 pages, 5½ x 8¼ in. Clothboard binding. Indexed and illustrated. Published by the Ronald Press Co., 15 E. 26th St., New York, N. Y. Price,* $3.75.

Properly made and properly applied time and motion studies can be powerful aids to the executive who must reduce production costs and meet present-day competition. In general, the treatment in this volume is from the point of view of operating economy, which is the particular theme of the first three chapters and is continued as the necessary objective in the chapters dealing with detailed practice. Since the results of any time and motion study program are secured from the operator, the second group of three chapters deals with his qualifications, his work habits and skill, and the nature and effects of fatigue.

The next chapter considers the qualifications and equipment of the analyst, with particular emphasis on his personal attributes and attitude towards his work and surroundings. The next four chapters give a detailed presentation of time and study methods, including the making of the study, working up the observations and applying the necessary allowances. Logical steps in time study practice are shown as applied in representative industrial concerns.

The rest of the book deals with motion study, including methods and devices for using motion study data, including the process chart, motion chart, motion analysis and the analysis of motion pictures. The exact times for performing all of the elementary motions are given to four decimal places in a table. These times, based on more than 1,000 observations each, have stood the test of more than three years of shop application. The arrangement of the work place and materials handling problems are given careful consideration, as are methods of determining and applying time study allowances.

PATENTS

Printed copies of patents are furnished by the Patent Office at 10 cents each. Address the Commissioner of Patents, Washington, D. C.

October 25, 1938

Metal-Working Machinery

Coiling Machine. Emmett S. Ellis, Detroit, Mich., assigned to Kelsey-Hayes Wheel Co., Detroit, Mich. Patent 2,134,036.

Sheet Material Gauging Machine. William J. Guyer, Chicago, Ill., assigned to Guyer Metal Products Corp., Chicago, Ill. Patent 2,134,184.

Machine for Finishing Spherical Surfaces. Allen C. Secor, Erie, Pa., assigned to The Standard Stoker Co., New York, N. Y. Patent 2,134,210.

Spring Forming Device. Charles R. Bergevin, Torrington, Conn., assigned to The Torrington Mfg. Co., Torrington, Conn. Patent 2,134,469.

Wheel Balancer—Dynamic-Type. Claude C. Bennett, South Bend, Ind., assigned to A. E. Feragen, Inc., Seattle, Wash. Patent 2,134,500.

Axle Press. Claude C. Bennett, South Bend, Ind., assigned to A. E. Feragen, Inc., Seattle, Wash. Patent 2,134,501.

Metal-working Apparatus and Method. John J. McLaughlin, North Tonawanda, N. Y., assigned to Buffalo Bolt Co., North Tonawanda, N. Y. Patent 2,134,526.

Nut Threading Machine. John J. McLaughlin, North Tonawanda, N. Y., assigned to Buffalo Bolt Co., North Tonawanda, N. Y. Patent 2,134,619.

Parts and Mechanisms

Welding Apparatus. Magnus Christensen and George Hunter Plaine, Barberton, James Edward Trainer, Fairlawn, and James Camp-

BEARING PROTECTION
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The correct oil film to each individual bearing... automatically
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AUTOMATICALLY Correct LUBRICATION
● The Bijur Automatic Lubricating System automatically feeds any number of bearings the metered oil film each requires. Maximum protection for machine life! Bearings, slides, gears . . . lubricated correctly, economically. None forgotten. ● Insure high-speed runs with new-machine accuracy. Avoid expensive production delays. Cut maintenance costs. Protect your investment! . . . With BIJUR.
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889

bell Hodge, Akron, Ohio, assigned to The Babcock & Wilcox Co., Newark, N. J. Patent 2,133,971.

Operating Mechanism and Machine Tools. Fred H. Bogart, South Euclid, Ohio, assigned to The Warner & Swasey Co., Cleveland, Ohio. Patent 2,134,024.

Gear Transmission. William F. Eckert, Ridley Park, Pa. Patent 2,134,109.

Fluid Conduit, for Spot Welder. Meril L. Eckman, Cleveland, Ohio, assigned to American Coach & Body Co., Cleveland, Ohio. Patent 2,134,110.

Variable Speed Drive. George W. von Hofe, Bound Brook, N. J., assigned to New Jersey Machine Corp., Hoboken, N. J. Patent 2,134,159.

Variable Speed Friction Gear. Ejnar Christiansen, Birmingham, England. Patent 2,134,225.

Operating Mechanism for Chucks. Hermann Paul Max Forkardt, deceased, late of Dusseldorf-Oberkassel, Germany. Patent 2,134,227.

Indexing Mechanism for Gear Grinder. Arthur Hitchcock Orcutt and Richard John Bullows, Birmingham, England, assigned to The Gear Grinding Co., Birmingham, England. Patent 2,134,234.

Self-Oiling Chain Sprocket. Charles W. Shartle, Jr., Houston, Tex. Patent 2,134,490.

Means for Dressing Grinding Wheels Used for Form Grinding. Herbert Henry Harley and James Yorston, Coventry, England. Patent 2,134,607.

Bearing. Fritz Pesarese, Grundschottel, Germany, assigned to Eisen- u. Stahlwerk Walter Peyinghaus, Egge, Germany. Patent 2,134,621.

Tools and Accessories

Tongs. Maurus Glas, Schmalkalden-Naherstille, Germany, assigned to Gerbrüder Heller, Schmalkalden, Thuriingia, Germany. Patent 2,133,984.

Gage. Nikola Trbojevich, Detroit, Mich. Patent 2,134,062.

Safety Device for Power Presses. Frederick W. Burgie and Joseph I. Kaul, Toledo, Ohio, assigned to Doehler Die Casting Co., Toledo, Ohio. Patent 2,134,071.

Shaft Straightener. Wayne D. Cohea and John R. Cohea, Frederick, Okla. Patent 2,134,073.

Wrench. John E. Goede, Newton, Kans. Patent 2,134,081.

Crystal and Bezel Mounting for Dial Gages. Warren Ames, Newton, Mass. Patent 2,134,093.

Inserted Cutter Blade and Mounting. Frank P. Miller, Meadville, Pa. Patent 2,134,140.

Internal Gage for Cylinders and the Like. Harold P. Phillips, Hastings, Mich., assigned to Hastings Mfg. Co., Hastings, Mich. Patent 2,134,262.

Gage. Theodore A. Olson, Pompton Plains, N. J., assigned to General Motors Corp., Detroit, Mich. Patent 2,134,372.

Drop Forging Die Structure. Martin Benjamin Wolf, St. Catharine's, Ontario, Canada, assigned to Thompson Products, Inc., Cleveland, Ohio. Patent 2,134,386.

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November 1, 1938

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SEEN AND HEARD

JOHN R. GODFREY

One Railroad Wants New Machinery

I have been in a number of railroad shops where those in charge didn't seem to realize how far behind the times they were in shop equipment. And not all were small shops either. So it is encouraging to find a railroad shop man who knows his machine tools are antiquated and is trying to get better ones by selling off the old ones for what he can get. The trouble in this case is that he isn't likely to get enough to make much of any showing against the cost of even good used machines.

He submitted a list of perhaps 30

to 40 machines to a dealer and wanted to apply the proceeds against new, or at least, newer machines. He was frank enough to give the age of nearly every machine, at least so far as his purchase records showed.

The newest machine was 11 years old—the average perhaps 25 years, with several patriarchs having 31, 37, 43, 47, 51 and 56 years to their credit —if that is the right word to use. While age does not bear the same relation to usefulness in a maintenance shop as in production work, these older machines had been draining the resources of the railroad in question for a long time.

More Mouse Traps?

Two more instances of what seems like unnecessary hauling of heavy materials came to light in Texas not long ago. One concern makes road roller wheels or drums casts them and machines them, and sends them to Cincinnati—*by truck*. The other gets heavy forgings from Lebanon, Pa., for use in oil-field equipment. The road roller drums weigh about a ton each, and these forgings are by no means light.

Neither concerns feels that it can get the material and workmanship any nearer home. Both suppliers probably feel a bit cocky over the demand for their products from such distant points. Perhaps it's a new edition of the old saw about "better mouse traps." But there can be no question as to the added cost to the consumer because of these long hauls—assuming, of course, that it was possible to secure satisfactory material near home, in each case.

Mail Order Machines

In the pattern shop of a good sized plant, I recently saw several small sized machines of what are sometimes called the mail order variety. They included bandsaws, circular saws and a shaper, for rounding edges and similar work. Near them were several standard sized machines with every indication of not being frequently used.

Inquiry verified the indications. "These small machines have it all over the big ones," said the boss. "We can get these started up and operating much faster than that big bandsaw for example. The blades cost less and the machines are easier to operate. They may look like toys to you, but we only use the big machines when these small ones are busy, or in the few cases where the work is extra large."

Machines of this size and type also seem to fill a niche in some machine shops. For light drilling and for small lathe work where great accuracy is not necessary, many small and even some large shops, are finding a place for them. They may be a partial answer to the call for simpler machines for work where the latest designs are not considered necessary.

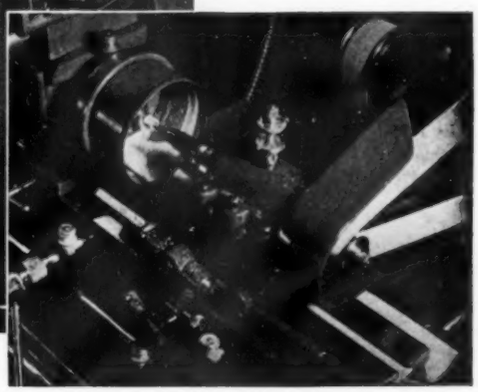
Extending a Lathe Spindle

A 3-ft. extension on the spindle of an old lathe had me stumped for a while not long ago. It was an old lathe with a long bed and this extension was supported in a steadyrest. The lathe had a motor driven grinding head mounted on the carriage. But why decrease the lathe capacity?

The answer was simple—after you knew it. The lathe was so old and had been used in short work for so long, that the ways were very badly worn near the headstock. The spindle extension carried the work beyond the worn part of the bed, so the work was fairly satisfactory. Of course, it was in a job shop with no planer that could true up the ways and no money to buy either a lathe or a grinding machine.

Small Hole Grinding

RIVETT
No. 104
INTERNAL GRINDER



Mounted wheel held in chuck grinding small bore with spindle turning at 30,000 r.p.m.

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R's and the Engineer

A. E. RYLANDER

Recently, some writer remarked that engineers as a class are poor speakers and poor writers, that only a minority use good English or qualify as even average spellers. And I believe that to be true; of the three R's, engineers as a rule are strong only in 'rithmetic.

Naturally there are exceptions. The technical world is replete with papers and writings that are scholarly in presentation, and numerous engineers are fine public speakers. It is also true that, as a class, engineers rank high in intelligence, among the highest of any of the professions, medicine and law not excepted. We are told that there are three kinds of intelligence: social, abstract and mechanical; in these, engineers lead in the latter and, trained to think things out to a conclusion, hold their own in both abstract and concrete analysis. A minority has social intelligence.

But, one can be a good engineer and a good writer as well. Having conceived an idea, having effected a technological improvement and having worked it out to a conclusion the idea has only a local value unless broadcast to the engineering world. The logical medium is the technical press, for unlike other matters of interest, technical discussions must be considered and analyzed. One doesn't resolve a problem of hydraulics, to cite an example, on a wave of emotion or while under the spell of an orator.

Good spelling and good English are assets when trying to sell an idea to a recalcitrant buyer, who often as not may be the big boss himself. He may not know you, beyond a nodding acquaintance, but rest assured that, once you have laid a report or a resume of a projected improvement before him, in writing, he will know you—for better or worse. Or, if you submit an article to an editor, your presentation—good, indifferent or bad—means, in the order listed, "accepted with pleasure," a headache in editing, or rejection.

Technical articles, whether specific or general, need not be stereotyped, nor confined to a norm. Clarity is essential, brevity preferred, but clarity should not be sacrificed to brevity. The thing is to arrest the reader's attention, to sustain it with a bit of leavening.

No Monotony Here

Whatever the woes of the small shop man in border cities, or anywhere away from the big cities, monotony is not on the list. In one shop, which is mainly devoted to automobile repair, I found a special shoe-last machine in the making—not to compete with the big makers but for a doctor who prescribes special shoes for the foot-weary. The doc takes a plaster cast of the pedal extremities, then makes a last to match the mis-shapen tootsies, and has shoes made to this last.

The boss of the shop took a wood turning lathe and rigged up a follower and a cutting saw to do the trick. The follower drops on the plaster cast, and the saw cuts the last to match. There is also a simple adjustment to enable the last to be somewhat larger than the cast when this is wanted.

Makers of last-turning machines need have no fear of competition, for this is in no sense a production machine. But the doc gets a machine for his work at a low price, and the shop gets a "fill-in" job that takes up the slack between motor repairs. And the boss has something to think about besides motors.

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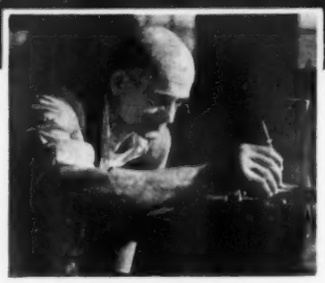

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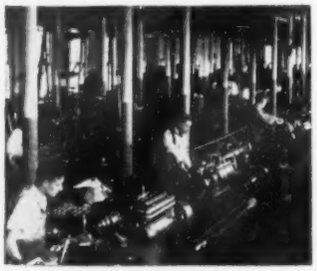

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